This issue: Precision Forging • Forming Stainless • Special Fixtures

SEPTEMBER • 1952

TOOLING and PRODUCTION

The Magazine of Manufacturing Management

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... puts it on a holder that soon pays for itself.

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YEARS of broad experience in forgings for almost every conceivable tool, die and stainless steel application have fitted our Forge Plants to deal expertly with any requirements you have in this exacting field.

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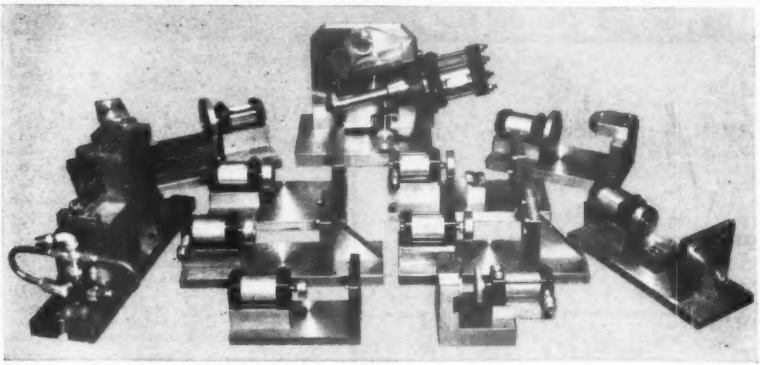
AL FINE TOOL STEELS SINCE 1854

INEXPENSIVE AIR CLAMPS REDUCE FIXTURE LOADING—UNLOADING TIME



A machine tool makes money only when it's cutting metal. Every second it stands idle while a fixture is being loaded or unloaded cuts into the profit picture.

Romec Pump Division, of Lear, Inc. has increased production 265% to 500% in more than 75 machining operations by using Bellows Han-d-Air cylinders to open and close fixtures and other workholding devices.

This midget air cylinder develops 100 lbs. of pressure at 100 lbs. of air. Its 1" stroke is ample for most clamping operations. Its overall size 4" x 1½" square, saves space. A threaded 5/16" piston rod simplifies installation.

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ORDER . . . . A TRIAL DOZEN . . . . TODAY

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The Magazine of

TOOLING and PRODUCTION

TOOL & DIE JOURNAL

1975 Lee Road • CLEVELAND 18, OHIO
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TOOLING and PRODUCTION is published monthly for plant operating and purchasing executives and department heads in 50 types of end product and contract manufacturing companies.

Every copy is directed to such an individual by name, by title, and by company gratis. See CAA certification.

These men, from whom emanate recommendations, requisitions and orders for needed materials, tools, equipment and accessories, comprise the Cycles of Buying Influence within their respective plants—CBI—and it is they who constitute TOOLING and PRODUCTION'S ever-vital reader circulation.

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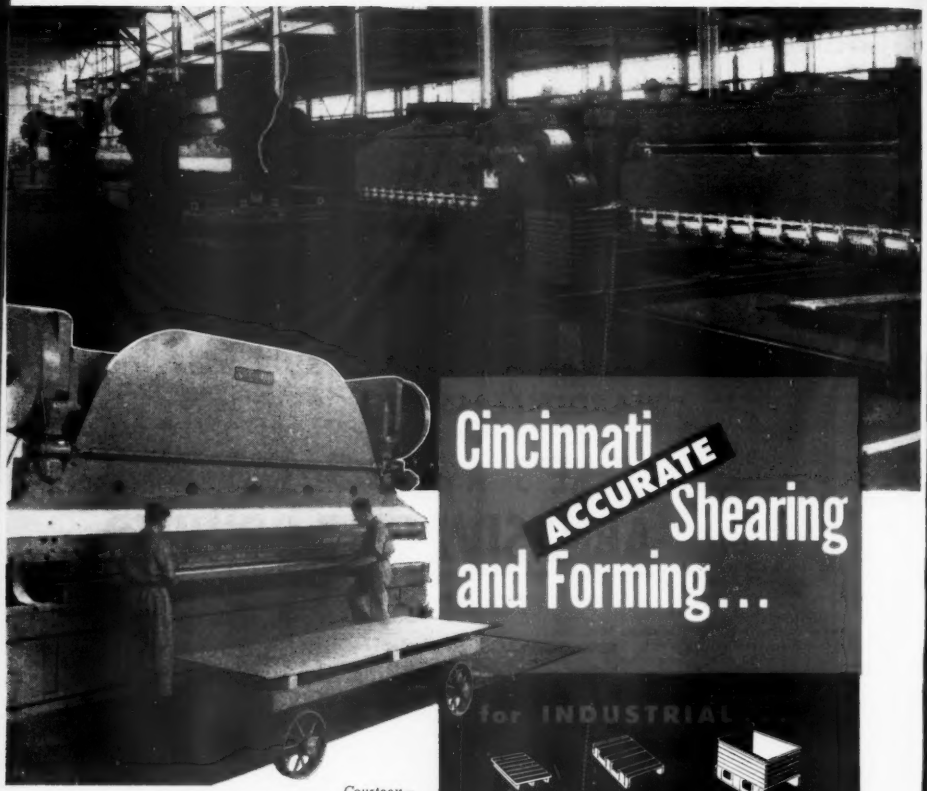

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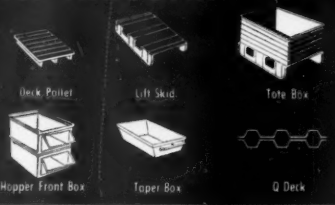

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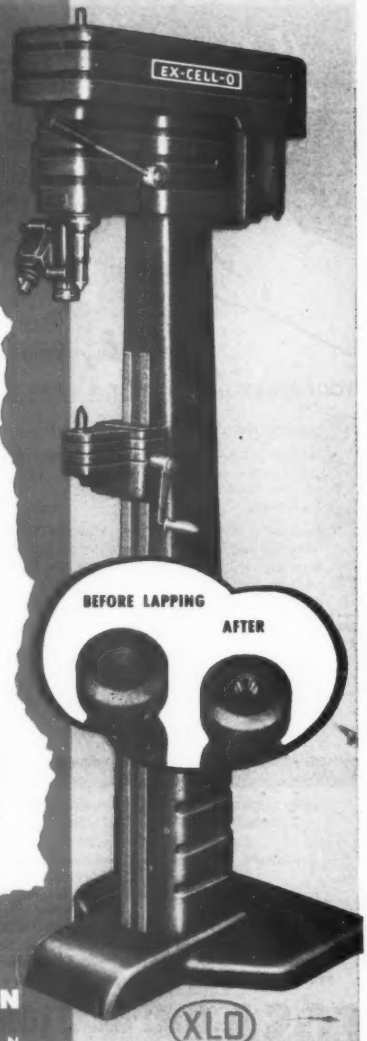

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

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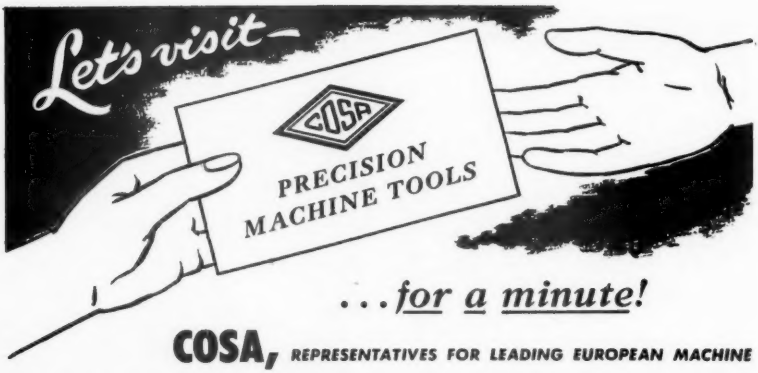

. . . for a minute!

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Your source for all Precision Machine Tools—from Small Bench Lathes to Large Boring Mills

IN DETROIT AREA contact DETROIT-COSA CORPORATION, 16923 James Couzens Highway, Detroit 35, Mich.

Wagner Hydraulic COLD SAWS

for—Semi-Automatic Fully Automatic—CUTTING

The dependability and efficiency of Wagner Cold Saws have been proven by the thousands of machines installed in Metal Working Plants throughout the world.

Features for Dependable Performance

- **TWO POINT DRIVE**—The double worm gear transmits power through helical gears to two points on the saw arbor. This two point contact withstands the heaviest stresses of constant operation.
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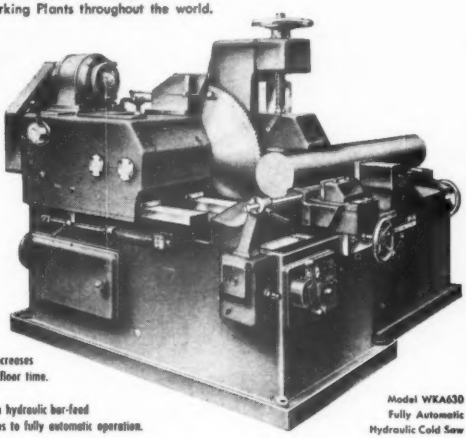
- **SEMI-AUTOMATIC OPERATION**—After the work is in position, only the movement of a single lever controls the cycle of operation—clamping—feeding—rapid return motion—release. This feature increases safety, makes machine fool-proof and reduces floor to floor time.
- **FULLY AUTOMATIC OPERATION**—Incorporating a hydraulic bar-feed into the hydraulic system easily converts these machines to fully automatic operation.



Model WKA630
Fully Automatic
Hydraulic Cold Saw

Wagner Cold Saws for Your Cutting Operations

SEMI-AUTOMATIC		**WK500**	**WK630**	**WK800**	**WK1000**	**WK1250**
Maximum Cuts	● Rounds	8"	10½"	13½"	16½"	21¼"
	I Beams	16" x 6"	20" x 6½"	24" x 7½"	24" x 7½"	24" x 7½"
FULLY AUTOMATIC		**WKA500**	**WKA630**	**WKA800**		
Maximum Cuts	● Rounds	7"	8½"	11½"	*All machines can be equipped with Mitre Vises for cutting mitres up to 45°*	
	I Beams	15" x 6"	19" x 6½"	23" x 7½"		

Write for Bulletin 39b fully describing these Cold Saws

COSA CORPORATION
405 Lexington Ave., New York 17

Your source for all Precision Machine Tools—from Small Bench Lathes to Large Boring Mills

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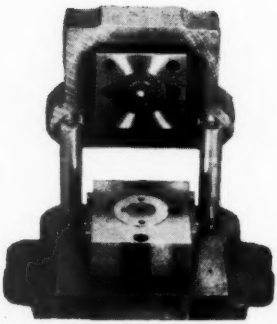

Made in 5 sizes:

¾"—1½"—2½"—4"—6"

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- MINIMIZES MACHINING
- CUTS WASTE
- PRODUCES SUPER WEAR-RESISTANT, NON GALLING TOOLS

JIC-06 . . . Oil Hardening, Non-Deforming . . . Full Length Kolorkoted Pink and Gray for Permanent Identification

This new combination of Timken® Graphitic Steel features in Hollow Die (Tubular Tool) form is Milne's latest bee-line to better, lower-cost tooling. Has a double advantage over standard oil hardening tool steels.

1. Free graphite makes it the fastest, easiest machining tool steel in tubular form and insures non-seizing properties.
2. Diamond-hard carbide particles guarantee super wear resistance.

Rough turned O.D. and I.D. Saw cut faces. Furnace annealed — no scale. Cut to any length.

Stocks of a range of sizes being built to meet demand. Write for a stock list and Milne's new Hollow Die Catalog section.

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Complete Line Of Tool Steels—Hollow and Solid

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Measure with Confidence with Tumico

There was a time when "hair-line" accuracy was industry's critical standard of measurement. Today, Tumico instruments divide and redivide that mythical "hair-line" many times.

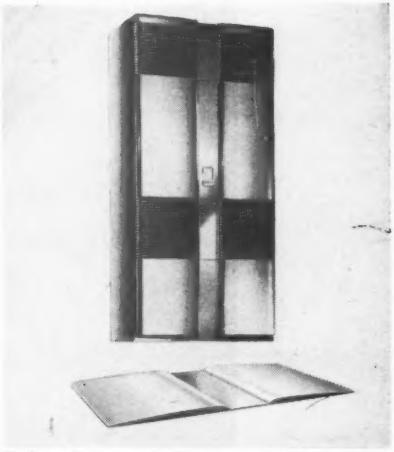
Tumico precision measuring tools are being used by a large segment of American industry. We cordially invite your inquiries on how to solve standard and special production measuring problems.

TUBULAR FEATHER TOUCH **MICROMETER CO.**

ST. JAMES, MINNESOTA

The trend is to more stampings WITH BLISS PRESSES...

1200 14-gauge drip pans are drawn and formed daily in this Bliss press which has a 400-ton blankholder pressure and 200-ton plunger capacity.



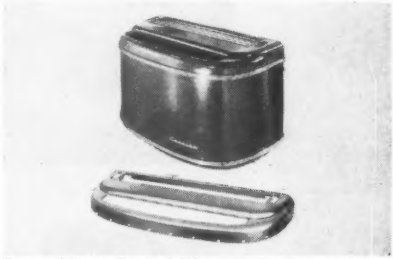
Hard-to-make contours in this center-section stamping for a Weathermaker are drawn from 20-gauge steel at the rate of 1800 daily.

Versatile Bliss Hydro-Dynamic Allows Unusual Metal Design

A new 600-ton Bliss double-action Hydro-Dynamic press helps Carrier Corporation produce nice-to-look-at but tough-to-make contours for its line of air conditioners.

Carrier's Vice President of Manufacturing reported that, "By varying ram, blankholder and cushion pressures and the draw cycle, we have been able to complete difficult drawing operations with sharp corners and small radii at the bottom... Actually, the press has exceeded our expectations."

Top performance? Of course—but it's all a matter of picking the proper press. It's what Bliss engineers mean by "the *right* press for the job."



Top panel for window-model Room Air Conditioner has intricate contours, sharp corners and bottom radii. Yet Carrier was able to produce them at the rate of 1200 per eight-hour shift.

E. W. BLISS COMPANY, CANTON, OHIO
E. W. Bliss (England) Ltd., Derby, England
E. W. Bliss Company (Paris), St. Ouen sur Seine, France

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BLISS ON YOUR PRESS IS MORE THAN A NAME ...IT'S A GUARANTEE!

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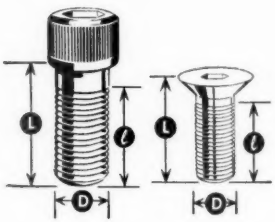
UNBRAKO® SOCKET SCREW DIVISION



WHY IS IT THAT 75% OF ALL SPECIAL SOCKET SCREWS ORDERED FROM SPS HAVE ODD THREAD LENGTHS?

75% of all screws classified by SPS as *specials* have odd thread lengths, probably because of widespread unfamiliarity with thread formulas.

In many cases, *standard* UNBRAKO Socket Screws can be substituted. They will save you time and money. They are available from the stocks of your local distributor. Ask him or write us for your copy of UNBRAKO *Standards*. STANDARD PRESSED STEEL CO., Jenkintown 36, Pennsylvania.

What Are the Standard Thread Lengths?

The authority for the thread formulas used by SPS and other threaded fastener manufacturers is Handbook H28, Screw Thread Standards for Federal Services, National Bureau of Standards. It reads:

The length of the screw thread is measured from the extreme point to the last usable thread and shall be as follows:

For American National—Coarse Thread Series	$\ell = 2D + \frac{1}{2}''$ (where this length of thread would be greater than half the screw length). $\ell = \frac{1}{2}L$ (where this length of thread would be greater than $2D + \frac{1}{2}''$).
For American National—Fine Thread Series	$\ell = 1\frac{1}{2}D + \frac{1}{2}''$ (where this length of thread would be greater than three-eighths the screw length). $\ell = \frac{3}{8}L$ (where this length of thread would be greater than $1\frac{1}{2}D + \frac{1}{2}''$).

SPS
JENKINTOWN PENNSYLVANIA

Screws too short to allow application of these formulas shall be threaded as close to the head as practicable.

CAP SCREWS • SET SCREWS • SHOULDER SCREWS
DOWEL PINS • PRESSURE PLUGS

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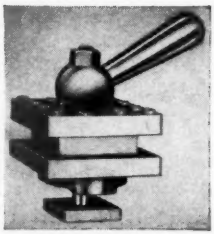
ROYAL TOOL POST TURRETS

WITH 12 POSITION INDEXING



Permit work to be done on ordinary lathes that ordinarily requires a turret lathe. Exceptionally flexible . . . Dependable accuracy maintained in every re-indexed position. Protected against dirt and metal chips. All working parts hardened and rust-proofed. Heavy-duty steel construction.

Made in complete size range, 3 models; Finger-tip control; 3 working positions for each tool; indexing in one complete unit. Fully guaranteed!

Dimensions Model No.	Tool Block Specifications	Tool Size Range	Approx. Lathe Swing	Shipping Weight	Price Each
• 250	4 tool, 12 position 2½" sq. x 1⅜" thick	¼" to ⅜"	Bench Lathes	3½ lbs.	$27.50
350	4 tool, 12 position 3½" sq. x 1¾" thick	⅜" to ½"	10" to 13"	9 lbs.	39.50
450	4 tool, 12 position 4½" sq. x 2¼" thick	½" to ¾"	13" to 16"	15½ lbs.	59.00

Model 250 available from stock ready for immediate use on Atlas, South Bend and Logan Lathes. Turrets available with a machineable base.

HIGH SPEED CORNER ROUNDING END MILLS

For use in milling rounded corners, etc. They are of the form relieved type and can be sharpened many times without changing the form.

Radius	Diam. of Shank	Largest Diam.	Whole Length	Net Price Each
1/16	3/8	7/16	2-1/2	$ 6.66
3/32	3/8	1/2	2-1/2	6.99
1/8	1/2	5/8	3	8.63
5/32	1/2	3/4	3	9.61
3/16	3/4	7/8	3-1/8	11.03
1/4	3/4	1	3-1/4	12.01
5/16	7/8	1-1/8	3-1/2	14.09
3/8	7/8	1-1/4	3-3/4	16.28

DOVETAIL CUTTERS
Shank Type — High Speed Steel

Designed to take the place of arbor type and threaded hole angle cutters. Advantageous in reducing set-up time. Ease of handling make them the ideal tool for milling dovetails.

45° and 60° angle R. H. cut are standard. Please specify angle.

Cat. No.	Angle	Diam. of Cutter	Width	Diam. of Shank	Over-all Length	Net Price Each
DT-24	45°	3/4	5/16	3/8	2 1/8	$ 7.19
DT-44	45°	1 5/8	9/16	5/8	2 7/8	10.57
DT-24A	60°	3/4	5/16	3/8	2 1/8	7.19
DT-44A	60°	1 5/8	9/16	5/8	2 7/8	10.57

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by increasing productive capacity

50% to 300%

Handles Stock up to 3/16" Thick

Aside from the tremendous increase in production figures you'll enjoy greatly reduced unit costs by installing Dickerman Die Feeds. Fully automatic, this feed eliminates many operations formerly required by the operator. Its high degree of accuracy reduces blanks and rejects incurred – furthermore, you'll have fewer regrinds and longer die life. Installing a Dickerman Feed is a sure way to beat labor shortage.

Write for further information today. Let us help you with your production problems.

H. E. DICKERMAN

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the handiest tool in the shop for

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Write us, describing the operation you're thinking of for Haskins equipment. We've years of experience at your service. Meantime, send for complete Catalog.

FOR PRODUCT INFORMATION USE INFORM-A-GRAM CARD

wire brushing deburring polishing sanding filing grinding buffing weld-blending die-finishing

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After all, when you have to depend on hand work it's best to resort to the equipment that will do the job most satisfactorily—and at lowest labor cost.

That's why Haskins flexible shaft equipment has for so long been *standard* equipment in so many of the finest and largest metal working plants—from the tool room to the production line.

Haskins equipment makes the operator's hands more efficient in all the operations listed above—and more! And it offers you long life in heaviest duty service for real economy.

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HORIZONTAL MILLING MACHINE MODEL SH 4d

VERTICAL MILLING MACHINE MODEL SV 4d

VERSATILITY WITH PRECISION!

STEINEL
HORIZONTAL & VERTICAL
MILLING MACHINES

The many speed ranges available, rigid construction and high precision workmanship make these machines ideal for the production of parts in the toolroom or production shop.

You'll find that ease of operation enables the Steinel Milling Machines to handle a large variety of work with efficiency, accuracy and complete dependability.

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NO
PRIORITY REQUIRED

PARTIAL SPECIFICATIONS

	SH 4d	SV 4d
Table working surface	24"x7¾"	24"x7¾"
Table traverse	11½"	11½"
Spindle speeds (6)	40-400 rpm or 63-630 rpm	85-852 rpm or 134-1344
Motor	1 or 1½ HP	1 HP

• *Write today for full information and specifications*

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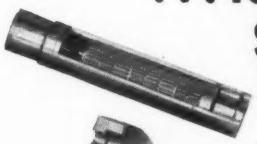
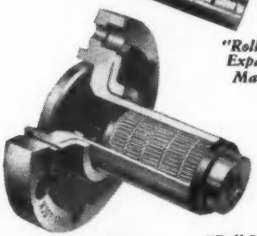
THE NEW CHUCKING TOOLS
POWERFUL AND ACCURATE

. . . for precision work



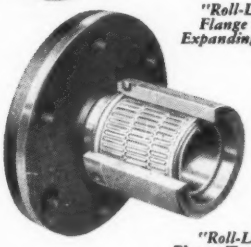
SCULLY-JONES
"ROLL-LOCK"* CHUCKING TOOLS



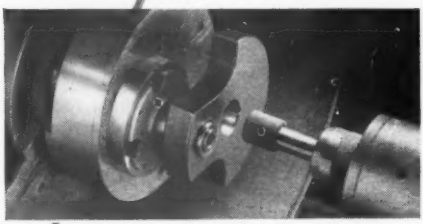
"Roll-Lock" Expanding Mandrel

"Roll-Lock" Mandrels, Arbors and Chucks use a new chucking method for holding work or tools. This method takes advantage of the elastic properties of metal.

When a very little turning force is applied to actuating ring or cone, the powerful wedging action of rollers expands or compresses the chucking surface to a shrink fit. This permits maximum torque and thrust to be transmitted, assuring accuracy often less than .0001". "Roll-Lock" Chucking Tools are engaged or disengaged quickly and easily. Yet the shrink fit cannot be loosened by reversing the rotation of the tools or by shock and vibration.



"Roll-Lock" Flange Type Expanding Arbor



"Roll-Lock" Flange Type Chuck

Shown to the right are two of the many applications in turning, grinding or inspection operations. "Roll-Lock" Flange Type Expanding Arbor and Tool Chuck being used in a finish grinding machine for holding the work and grinding tool.

**"Roll-Lock" is a trade mark of Scully-Jones and Company.*

WRITE FOR BULLETIN No. 17-50
giving detailed description and technical data on these and other "Roll-Lock" Chucking Tools.

Scully-Jones AND COMPANY
1913 S. Rockwell St., Chicago 8, Ill.

R-5828MT

YOU GET LOW COST FAST ACCURATE PRODUCTION WITH OUR STANDARD AND SPECIAL TOOLS

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Remember "INDEX"

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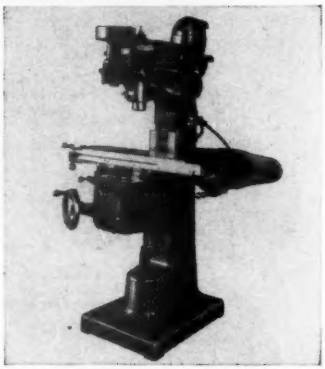
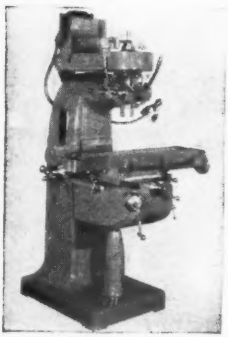
MILLING MACHINES

For High Production and Precision, Low Original and Maintenance Cost



MODEL 40, VERTICAL MILL has proved for 14 years that precision need not be expensive. Thousands in use, giving highly satisfactory performance. While it is not a jig borer, it is widely used for accurate boring and locating. The improved spindle drive gives nine spindle speeds, an ample range for all operations. CAPACITY, ⅛" to 1" end mills in tool steel. TABLE, working surface 8" x 26", 8" x 34" overall.



See Us at the A.S.T.E. Show, March, Chicago

◄ **MODEL 55** IMPROVED VERTICAL MILL. A speed range of 80 to 2700 RPM's, 1 H.P. drive, 3⅛" quill, extra rugged spindle, capacity of ⅛" to 1½" end mills in steel. Spindle quill travel is 5¼". Table 40" x 9" or larger.

MODEL 60 PLAIN HORIZONTAL MILL. A full No. 1 that equals or exceeds a light No. 2 in capacity. Designed for the average tool room, but its rigidity and low maintenance cost make it suitable for requirements of production shops. Standard Table 40" x 9" with larger table optional.

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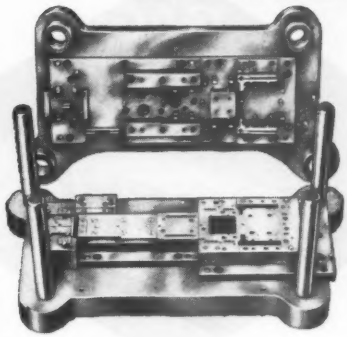
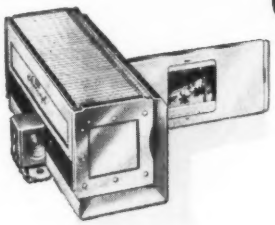
200 frames a minute. on PRODUCTO DIE SET





PERFORMANCE

12,000 pieces produced per hour
Over 2 million pieces produced between grinds
Continuous operation for 20 months

EQUIPMENT

Die: six-station (piercing, forming, cut-off)
Die Set: Producto special four-pin
Feed: special high-speed automatic

SPECIFICATIONS

Frame Size: 2.157 inches by 2.020 inches
Tolerances: plus .000 inch minus .005 inch
Material: .010 inch thick 52 S-H38 aluminum

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It is no secret that the ease of operation of the slide changer, illustrated above, is due to the precise stamping of the frames. To obtain consistently accurate frames, the Airequipt Mfg. Co., New Rochelle, N. Y., selected a Producto die set to mount their die. Result — practically no rejects, and an amazing production rate of 200 frames per minute!

Call your nearest Producto branch . . . they have the answer to greater stamping accuracy and higher production.

THE PRODUCTO MACHINE COMPANY
970 Housatonic Ave., Bridgeport 1, Conn.

FOR PRECISION DIE SETS . . . *FAST* . . . CALL . . . PRODUCTO

ALSO MAKERS OF DIE ACCESSORIES, FEEDING EQUIPMENT, VISES, MACHINERY.

4P052

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Now you can measure work-in-process in units from .0001" to .00001" without removing the work from the machine or fixture . . . or lifting the work from the bench. Apply the new No. 955 Brown & Sharpe Electronic Caliper to the work and take your readings on the No. 950 Electronic Amplifier. Convenient 0" to 4" measuring range is provided by four interchangeable jaws . . . only one master is required for any particular setting. An aligning attachment is available which provides a positive three-point bearing when caliper is applied to long work pieces. Write for illustrated Catalog. Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.

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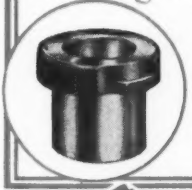
Send for Catalog and name of nearest Distributor



For a *greater variety* of Drill Jig Bushings—specify American. Our Distributors, located in every major city throughout the U. S. and Canada, carry a wide variety of sizes and types for immediate, free delivery. If you have an unusual Drill Bushing problem, our staff of competent engineers is at your service. American Drill Bushing Co. specializes only in Drill Jig Bushings, and assures you of fast service because our Distributors stock a *GREATER VARIETY.*

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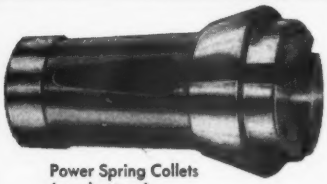
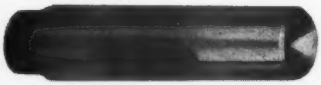
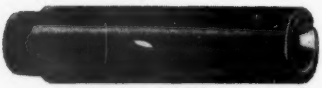


Power Spring Collets
(regular type)

Power Spring Collets
(taper nose type)



Feed Fingers (regular type)



Master Feed Fingers and Pads

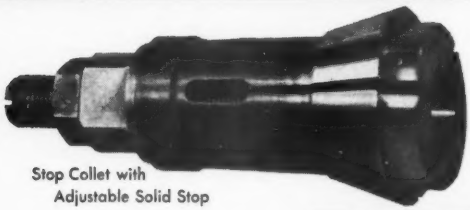
Master Feed Fingers
with Adjustable Tension

HARDINGE
ELMIRA, N.Y.

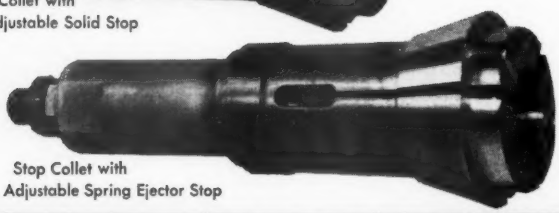
PRECISION PRODUCTS
for **BROWN & SHARPE machines**

For maximum production efficiency, specify Hardinge precision products for your Brown & Sharpe Automatics and Wire Feed Screw Machines. Reduce tooling costs and step up production with these and other Hardinge precision products engineered, customer-shop tested, and approved for Brown & Sharpe machines. Write for Catalog 36 — contains complete descriptions, specifications, and ordering information.

Deliveries from stock



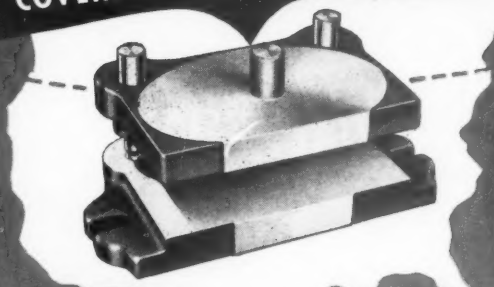
Stop Collet with
Adjustable Solid Stop



Stop Collet with
Adjustable Spring Ejector Stop

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

DETROIT DIE SET SERVICE COVERS INDUSTRIAL AMERICA



YOUR "DETROIT" DIE SET MAN CAN HELP YOU

Your "Detroit" Die Set man knows die sets. Call him in . . . talk over your die set problems with him. Get from him full facts about the accuracy of "Detroit" parallel surfaces, the trueness of pins, the fine finish, the thorough inspection at the factory. You'll see that "Detroit" leaves nothing undone to assure easier mounting and longer production runs. Call your "Detroit" man.

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DETROIT DIE SET ★

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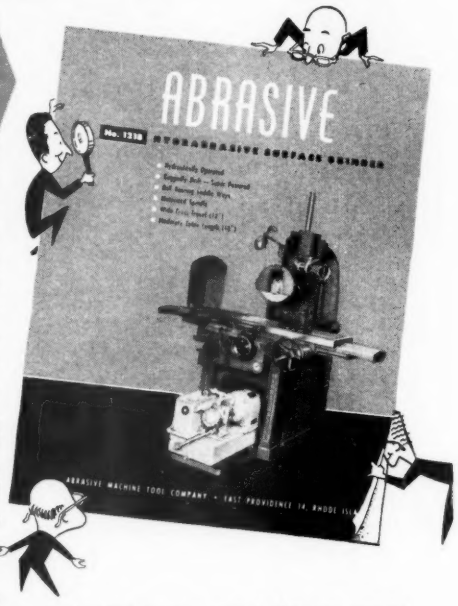
Read all about this Surface Grinder!



Here's a brand new catalog — packed with facts and figures about the 1218 Hydrabrasive Surface Grinder. If you're concerned with getting better output and improved quality in your surface grinding operations, you'll find this hydraulically operated surface grinder fits right into your plans. The 1218 Hydrabrasive, because of its wide cross travel (12") and moderate table length (18"), takes the load off your heavy grinders on many classes of work.

ABRASIVE MACHINE TOOL CO.
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ACCURACY BOOSTS PRODUCTION

Abrasive Quality Is Reflected in the Finish of Your Product

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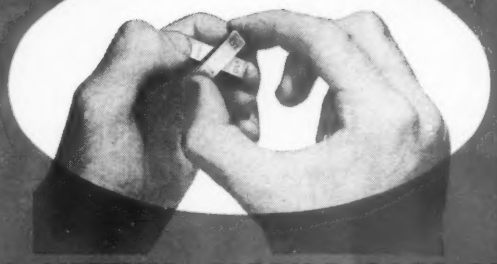
acclaimed
for permanent precision



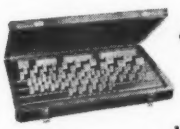
FONDA LIFETIME-CARBIDE GAGE BLOCKS

With more than 100 times the wear of steel and highest corrosion resistance, Fonda Lifetime-Carbide Gage Blocks need never be replaced or recalibrated under normal usage. Acclaimed by leading manufacturers in the metal-working industry — and many others — who must have permanent precision. The unsurpassed excellence of Fonda Lifetime-Carbide Gage Blocks is further confirmed by the National Bureau of Standards.

FONDA "ULTRA-FINISH" STEEL GAGE BLOCKS — for applications requiring less wear and corrosion resistance — are made from a carefully selected grade of high-carbon tool steel which has properties for high hardness, dimensional stability, and wear resistance.

"ULTRA-FINISH" gives superior flatness and surface finish to all Fonda Gage Blocks. This exclusive machine-lapped finish makes possible effortless wringing and unbelievable adhesion. Wringing is done with the blocks clean and dry, eliminating surface films that produce errors.

Write for the new 1952 edition of our catalog: "Precision in Millionths."



82-piece set rectangular

FG

82-piece set square

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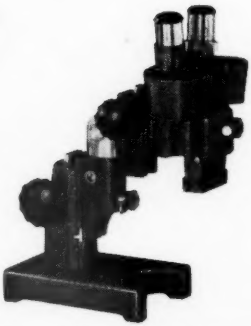
Let these 3 OPTICAL AIDS answer your PRECISION PRODUCTION PROBLEMS

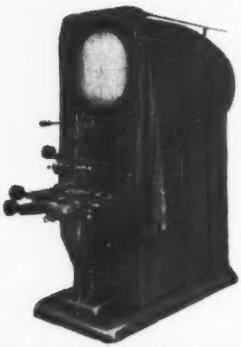
1



INDUSTRIAL STEREOMICROSCOPE

You save time and money by achieving greater speed and precision accuracy in small parts assembly operations . . . and in inspection of tools and finished parts . . . with this sturdy, dustproof instrument. *The finest optical system ever produced for stereoscopic work* assures you of accurate results. You get clear, sharp, three-dimensional images, and a *wider critical focus than ever before.* The *unreversed,* magnified image is more easily interpreted by the average user. Optical head is furnished in several different mounts for incorporating into machine tools and inspection setups. Write for catalog D-1029.

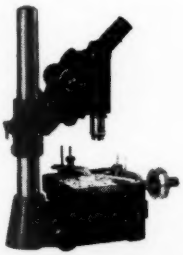
2



CONTOUR MEASURING PROJECTOR

No other projector can match its accuracy: angular measurements to ± 1 minute of arc with a protractor screen, and direct linear measurements to ± .0001" over a range of 4" x 6" with the cross slide stage. Dimensions, angles, and profiles of production-run parts can be compared directly with a *traced outline* of the projected image of the master part, or with a large scale drawing superimposed on the screen. Inaccuracies are quickly spotted. Write for catalog D-27.

3



TOOLMAKERS' MICROSCOPE

This sturdy microscope gives you one inch linear measurements to ±.0001" and angular measurements (with protractor eyepiece) to ± 1 minute of arc. Operation is extremely *simple* and *fast.* Opaque and transparent objects of any contour can be measured. Write for Catalog D-22.

WRITE for complete information on these three important optical aids designed to save you time and money. You may be paying many times over their moderate cost in lost time and rejects. Bausch & Lomb Optical Co., 79589 St. Paul St., Rochester 2, N.Y.

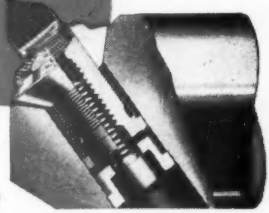
B&L Bausch & Lomb *Quality Control* Instruments

MICROBORE
by DeVLIEG

Special Boring Bars

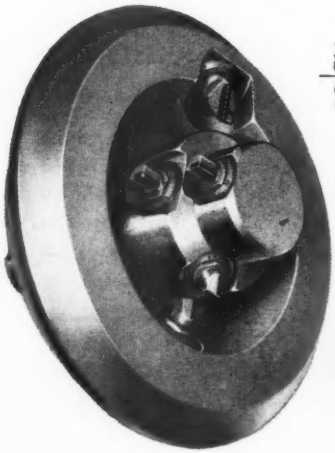
FOR PRECISION WORK
EQUIPPED WITH STANDARD MICROBORE TOOLS

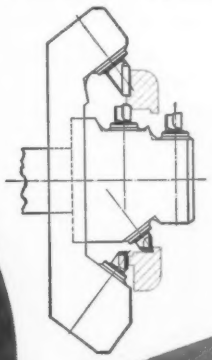
BORING ●
TURNING ●
FACING ■



Each tool independently adjusted by proven micrometer, vernier principle.

Illustration shows a special tool used in boring and turning a bearing housing for farm implements.





There is a Microbore representative in your area who will be pleased to call on you for further consultation.

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DeVLIEG MICROBORE COMPANY
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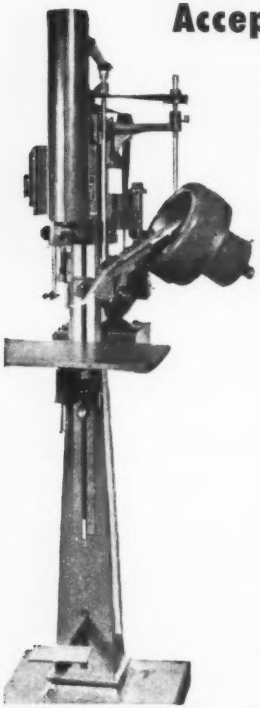
Yes, We Can Do It!

We Can Quote on Your Application, Accept Your Order and DELIVER



We are in an enviable position whereby we can deliver the answer to your assembly problem in the form of a particular piece of equipment designed especially for your needs . . . We can do it NOW—not maybe—some time in the future. Though generally speaking, deliveries throughout industry are uncertain, and this situation probably may continue for some time, our position is different . . . We have marshalled our resources and facilities in a way whereby we can positively assure the execution and delivery of your orders without delay.

DETROIT POWER SCREWDRIVERS, HOPPER FEEDING UNITS

NUT DRIVERS, SPECIAL ASSEMBLING MACHINES

Thousands of manufacturers have profited through greatly stepped-up production as a result of our service. You, too, can benefit by the use of D. P. S. power-driven machines. Get further details. Also send sample assembly for production estimate.

DETROIT POWER SCREWDRIVER CO.

2827 W. FORT ST. DETROIT 16, MICH.

Logan 940-2
Quick Change Gear
Turret Lathe
11" Swing, 1" Collet Capacity,
1 5/8" Spindle Hole

PRODUCTION MASTERPIECE

THE *Logan* LATHE

Puts Profit In Production

Industry's respect for the Logan Lathe as a metal-working production tool is not an overnight development. Through the years, Logan Lathes have put many a production line on a profitable basis. Today, with its 11" swing, 1" collet capacity, and 1⅝" spindle hole, the production efficiency of the Logan Lathe is being used on a wider scale than ever before.

The Logan is easily set up for every type of lathe turning operation. The Logan ball bearing mounted spindle has the sustained accuracy at high speeds to hold precision tolerances. The lasting accuracy and rugged durability of Logan construction keep production going at top efficiency, at minimum cost per finished part. For the production line, tool room or machine shop, no other lathe of comparable specifications can match the Logan in economy.

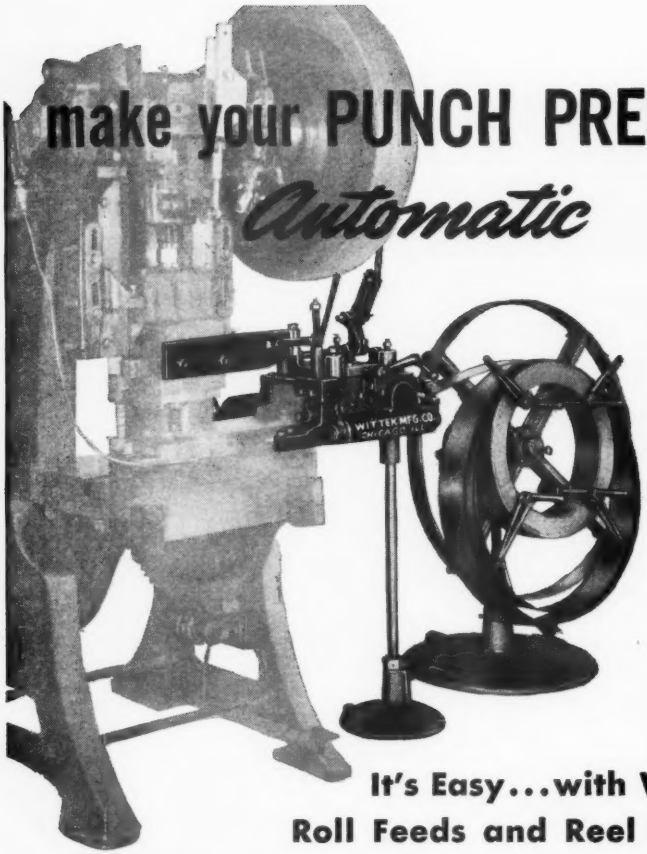
WRITE FOR THIS LOGAN LATHE AND SHAPER CATALOG

LOOK TO LOGAN FOR BETTER LATHES AND SHAPERS

LOGAN ENGINEERING CO.
4901 West Lawrence Avenue, Chicago 30, Illinois

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR KEY NUMBERS

make your PUNCH PRESSES *Automatic*



It's Easy...with WITTEK Roll Feeds and Reel Stands

Wittek Roll Feeds handle any type of coiled strip stock and are made in single roll, double roll, and compound types with straighteners, in models to feed in any of four directions. They are reliable and accurate with simple, quick adjustment of feed length. Standard sizes and models meet a wide variety of press size and capacity conditions.

Wittek Reel Stands facilitate handling coiled stock.

Write for full particulars

WITTEK Manufacturing Co.

4323 W. 24th Place, Chicago 23, Illinois

Automatic ROLL FEEDS AND REEL STANDS

FOR PRODUCT INFORMATION USE INFORM-A-GRAM CARD

Latrobe

Invites comparison

of standard process tool steels with *"Desegatized"*® * quality.

If you are not using *"Desegatized"* Steels, Latrobe offers you a simple, yet convincing, method of checking the steels you are using against *"Desegatized"* quality.

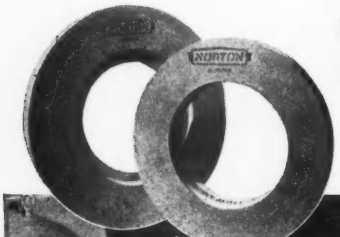
Ask your Latrobe representative for details.

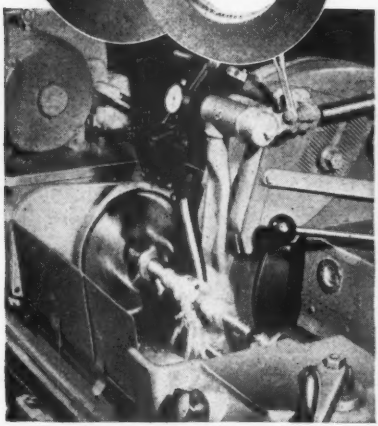
*ALL LATROBE HIGH SPEED STEELS AND HIGH CARBON—HIGH CHROMIUM DIE STEELS ARE FURNISHED AS *"Desegatized"* MATERIAL.

Latrobe Steel Company, Latrobe, Pa.

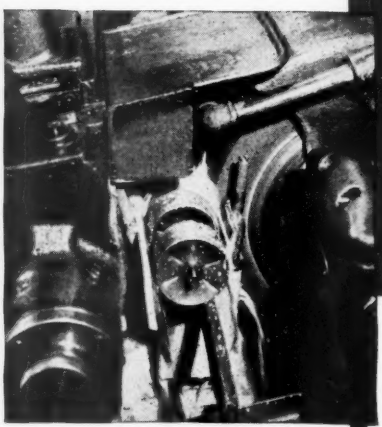
Sole Producers of Desegatized Steels

Protect YOUR O. D. GRINDING INVESTMENT with Norton Wheels





Cylindrical grinding small shafts on a production basis.



Plunge-cut centerless grinding of textile machine pulleys.

NORTON ABRASIVES

Making better products

FOR PRODUCT INFORMATION USE INFORM-A-GRAM CARD

Buying machines for O.D. grinding — cylindrical or centerless — is a sizable investment, to which you give a lot of serious thought. But remember:

No chain can be stronger than any of its links — and no grinding machine can be more efficient than its grinding wheels.

That's why it will pay you to weigh every condition carefully in your selection of the right grinding wheel. Because without the *right* wheel the costliest grinding equipment will not pay off for you as it should in more production at lowest possible cost.

Then consider this:

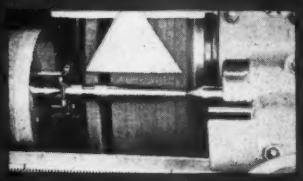
No matter what your O.D. grinding jobs are, Norton makes wheels that are exactly right for them. And your Norton Distributor is ready to tell you exactly which wheels you need.

Norton Safeguards for Lower-Cost Grinding

Norton Abrasives, ALUNDUM* (fused alumina) and CRYSTOLON* (silicon carbide) are made in a variety of types and grain sizes for best results on every material handled in cylindrical or centerless grinding.

Norton Bonds, vitrified, resinoid, shellac and rubber are available for cool, free cutting action, extra long wheel life and just the finish you want.

Norton Service includes the most comprehensive applicational aid in the field. In practically every case your Norton Distributor can quickly tell you the correct sizes and types of wheels to use. And if your problems are unusual, he can call on a Norton Abrasive Engineer to give you double assurance of the right wheel for every job.



Test Your I.Q. on O.D. Grinding

How many of these questions on cylindrical and centerless grinding can you answer correctly?

- *What is the usual range of wheel speeds in these types of grinding?*
- *What conditions prevent wheels from cutting freely?*
- *What are the causes of chatter marks?*
- *When should a filler be used in the coolant system?*
- *What adjustments can you make if a wheel is acting soft? . . . if it is loading or glazing?*
- *What factors govern the choice of abrasives, grain sizes and bonds in wheels for O.D. grinding?*

You'll find answers to these and many other everyday questions on O.D. grinding applications — together with convenient selection charts for your general guidance — in this handy illustrated booklet. Ask your Norton Distributor for *The A.B.C. of O.D. Grinding*, or write direct for Form 2006. NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities.

to make other products better

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR KEY NUMBERS

USE HARIG For TOP production

Proven . . .
- LESS DOWN TIME
- LOWER COST PER PIECE
- PRECISION WORKMANSHIP
- GREATER PRODUCTION
- LONGER DIE LIFE

ELIMINATE production bottlenecks caused by premature die wear and breakdowns! You too can change to HARIG tools and dies and save thousands of dollars as have many leading manufacturers. Consult our engineering staff — experienced in designing and building dies for every purpose — regarding your current die demands.

SEND NOW . . .
for your free copy of
"HARIG—America's Foremost Precision Diemaker"

HARIG MANUFACTURING CORPORATION
5761 West Howard Street, Chicago 31, Ill.

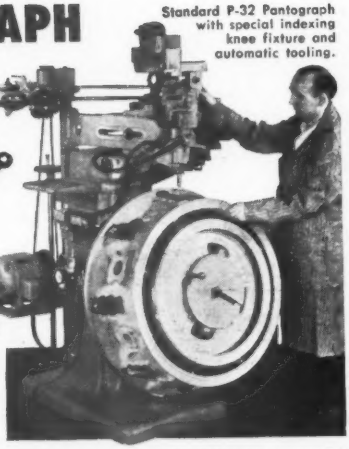
GORTON PANTOGRAPH

Solves Complex Profiling Problems with Automatic Cutting Cycle

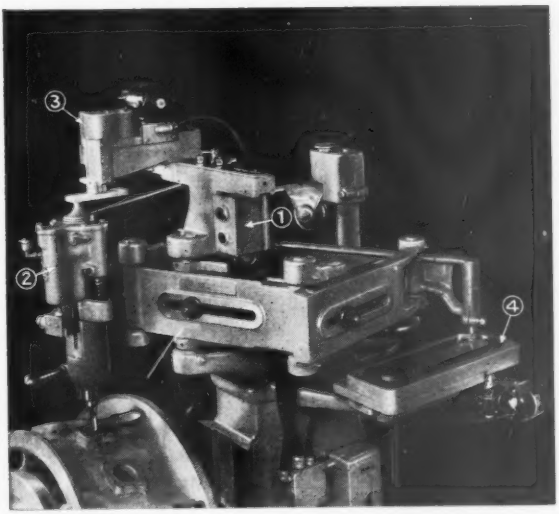
PROBLEM: Profiling eight ports in outside portion of aircraft part, a large aluminum-alloy casting. The sides of each port are parallel; one end has a true radius, the other end is parabolic.

SOLUTION: Gorton P-32 Pantograph profiles all eight ports at the rate of 2.3 minutes per port. Cutting cycle is automatic; indexing is manual.

This is truly a power-driven tracer-control job that would require hours if done by a combination of other methods.



Standard P-32 Pantograph with special indexing knee fixture and automatic tooling.



Here's How It Works

1. Complete cutting cycle begins when "start" button is pressed.

2. Air cylinder automatically feeds cutter down to cutting position. Cam-operated spindle down feed then takes over. Upon completion of cut and after spindle retracts, this air cylinder further retracts cutter for clearance.

3. Speed of spindle down feed during cutting is controlled by cam through a Variac.

4. Motorized chain-driven master starts automatically when "start" button is pressed.

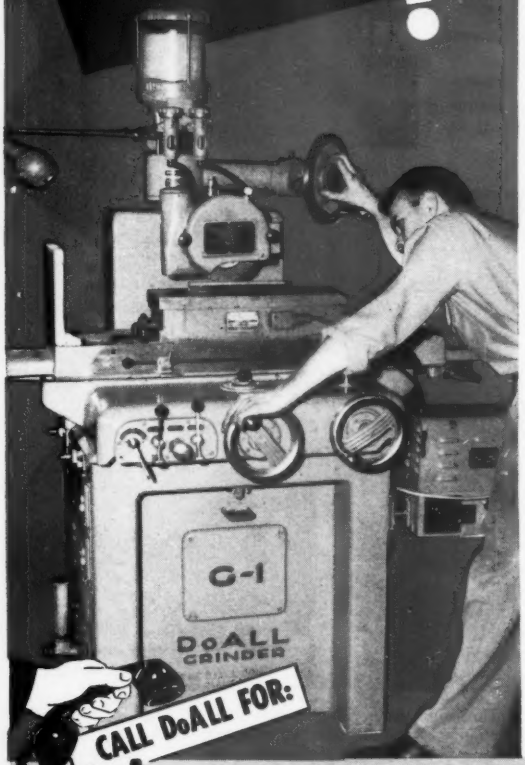
This is just one of many Gorton tracer-controlled production short-cuts which might save you time and money. For complete information, clip and mail the coupon now.

Please send at once complete information about the Gorton line contained in Bulletin 1655-1209.

Firm .....
Name .....
Title .....
Address .....
City, State .....

CAN YOUR SURFACE

Will they take the EXACT depth of cut for which you set the Down-Feed Handwheel ?



HERE'S a way to put a grinder through its paces—to find out if its got what it takes! Handwheel graduations in ten-thousandths don't mean a thing unless the wheel will obey the setting.

DoALL Precision Hydraulic Surface Grinders will take a cut that is right on the nose because they are rigid and rugged and machined to exacting perfection. The vertical column is 30 inches long to reduce misalignment to microscopic proportion. There is an automatic take-up on the spindle bearings to compensate for wear and temperature change. The frame is massive with a single-piece column support and base. The husky spindle support is dowelled and bolted to the column.

You have to see a DoALL Grinder perform to believe it—see it take .010" cuts with .010" crossfeed in high chrome, high carbon steel true to the down-feed setting in one pass.

Let your local DoALL Sales-Service store demonstrate a DoALL Grinder right in your own plant. There is no obligation.

THE DoALL COMPANY

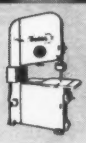
254 N. Laurel Ave.
Des Plaines, Illinois

Ask For Grinder Catalog

. . . complete information on the complete line of DoALL Grinders for toolroom and production work.

CALL DoALL FOR:

CONTOUR-MATIC


ZEPHYR

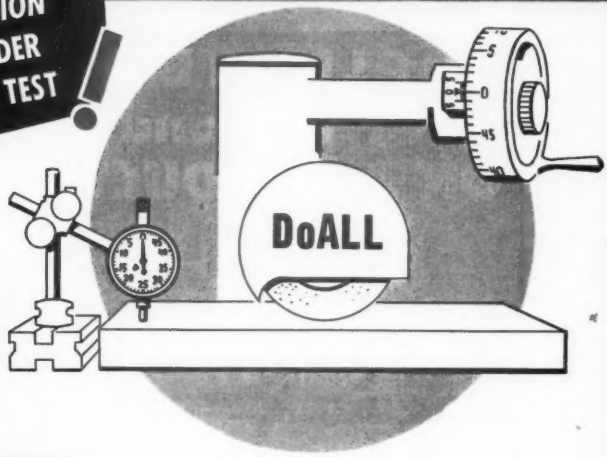
CONTOUR

BAND FILER

SAW BANDS

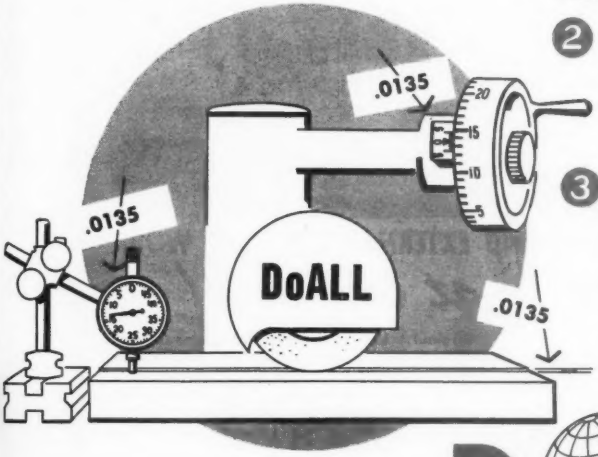
GRINDERS DO THIS?

A DoALL PRECISION SURFACE GRINDER WILL PASS THIS TEST



1 SET THE HANDWHEEL to remove .0135" of stock. Position a dial test indicator at zero reading on the work surface.

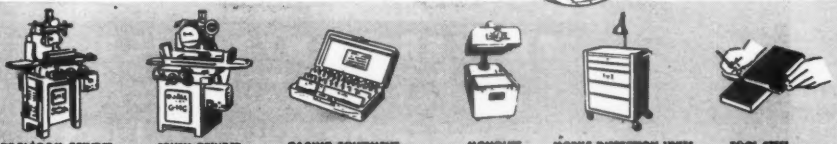
2 GRIND THE PIECE.



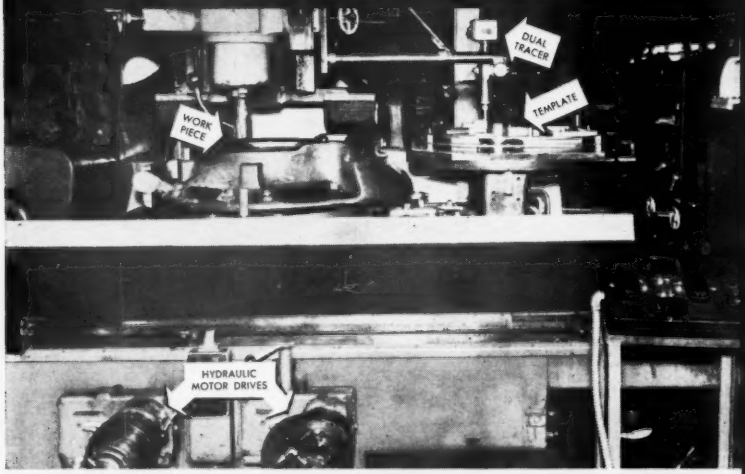
3 CHECK THE MATERIAL to see if exactly .0135" has been removed. If you did the job with a DoALL Grinder the dial indicator will now show the work surface exactly .0135" lower than before grinding.

DoALL

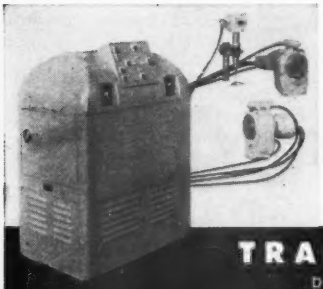
GR-75



DUPLICATE MACHINED PROFILES and CONTOURS ON A PRODUCTION BASIS



PERFORM INTERNAL AND EXTERNAL CONTOUR WORK ON LATHE OR MILL... *at low cost!*



Original accuracy, normal cutting speeds, simple operation. (1) Controls two feeds simultaneously. (2) Does not interfere with conventional use of machine. (3) Applicable to most standard machine tools . . . This may be the answer for which you have searched . . . Write for our catalog.

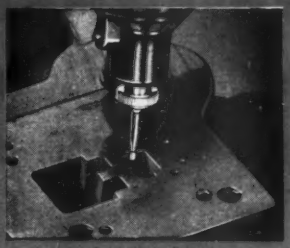
90° shoulder and contour on lathe work

TRACER CONTROL CO.

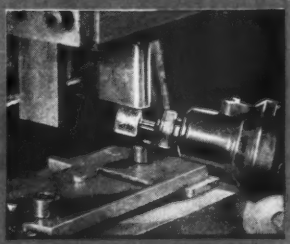
Distributors for Lodge & Shipley Duplicator

595 E. 10 Mile Road • P. O. Box Q • Hazel Park, Mich.

Marking Parts



Grinding Dies



Sharpening Machine Tools

Burring Machine Parts

PAYS FOR ITSELF ON "HARD-TO-GET-AT" JOBS

DREMEL *Electric* MOTO-TOOL

APPROX. 27,000 R.P.M.

"THE POCKET-SIZE MACHINE SHOP"

Dremel Moto-Tools are time-tested—have been widely used in industry for over fifteen years. A veteran of World War II, Moto-Tool served in war plants and at military maintenance bases throughout the world. Thousands of these mighty midgets helped to make the atomic bomb—were used to establish production records in defense industries during the last war. Hundreds of toolroom and production line operations, such as polishing and grinding dies, burring parts, marking tools, sharpening cutters, touch up jobs, etc. are accomplished in seconds, **without tearing down "set-ups."** Moto-Tool is sturdily constructed for long lasting industrial service. Weighs only 13 oz.— dynamically balanced for vibrationless operation.

MOTO - TOOL KIT NO. 2 contains 23 accessories, including high-speed steel cutters and Model 2 Moto-Tool in natural finish hardwood case ——— **$23.50**

MOTO-TOOL No. 2, with one emery wheel point ——— **$16.50**

Dremel **HIGH - SPEED STEEL CUTTERS** and balanced wheel points are available for all makes of hand grinding tools.

Write For Industrial Catalog

DREMEL MFG. CO. Dept. 522-J **RACINE, WIS.** U.S.A.

NOW YOU CANG
TOOL STEEL INH

New "GRAPH-MO HOLLOW-BAR" for longer wear of Graph-Mo with the eco

HERE'S big news for makers of ring gages, dies and other ring-shaped tool steel parts! A new product—"Graph-Mo® Hollow-Bar"—gives you all the advantages of Graph-Mo tool steel *plus* all the advantages of a hollow bar section.

With "Graph-Mo Hollow-Bar" you can eliminate drilling, make finish boring your first step. The hole is already there. You cut machining time, reduce scrap loss, get more parts per ton of steel!

And you get all the proven advantages of Graph-Mo—a special kind of tool steel that contains free graphite and diamond-hard carbides in its structure.

User reports show that Graph-Mo outwears other tool steels an average of three to one.

Tests prove it machines 30% faster than other tool steels.

It has minimum tendency to pick up, scuff or gall.

12-year tests prove it's the most stable tool steel made.

It gives uniform response to heat treatment.

All these advantages, plus the economy of the hollow bar section, make "Graph-Mo Hollow-Bar" the big news of the year for makers of ring-shaped tool steel parts.

"Graph-Mo Hollow-Bar" comes in sizes ranging from 4″ to 16″ O.D. with a variety of wall thicknesses. It is distributed through A. Milne and Company and Peninsular Steel Company. And it's available in the following cities: New York, Boston, New Britain, Philadelphia, Buffalo, Pittsburgh, Cleveland, Akron, Dayton, Toledo, Detroit, Grand Rapids, Indianapolis, Chicago and San Francisco.

ADVANTAGES OF GRAPH-MO

- Most stable tool steel made
- Outwears others 3 to 1
- Machines 30% faster

PLUS

- Minimum tendency to pick up, scuff or gall
- Uniform response to heat treatment

For full information on this money-saving new Timken® steel product, write The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

Specialists in fine alloy steels, graphitic tool steels and seamless tubing

FOR PRODUCT INFORMATION USE INFORM-A-GRAM CARD

NGET GRAPH-MO® HOLLOW BARS!

R" combines the faster machining and the economy of a hollow bar section

ADVANTAGES OF HOLLOW BARS

- No drilling
- Finish boring is first step
- Less machining time
- Less scrap loss
- More parts per ton of steel

EQUALS

ADVANTAGES OF "GRAPH-MO HOLLOW-BAR"

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR KEY NUMBERS

NEW boring tool set by PORTAGE Quick Change

FOR
- BORING MILLS
- TURRET LATHES
- MILLING MACHINES

P. D. Q.
(Portage Double Quick)

Featuring the new... ....TRIPLE lock grip

Portage Holders

No. 4, 5, 6, Morse Tapers
No. 40 & 50 Milling Machine Tapers
Holders designed to fit any application.

PORTAGE opens a new era in Quick Change Tools. Tapered contact with the new TRIPLE LOCK, assures faster tool change, positive repositioning, greater rigidity and longer wear life. A really COMPLETE set for BORING, MILLING and TURRET LATHE use. Also supplied (if desired) is a wooden rack especially designed for the set.

If you have not seen this . . . proved on the job set . . . write for details NOW.

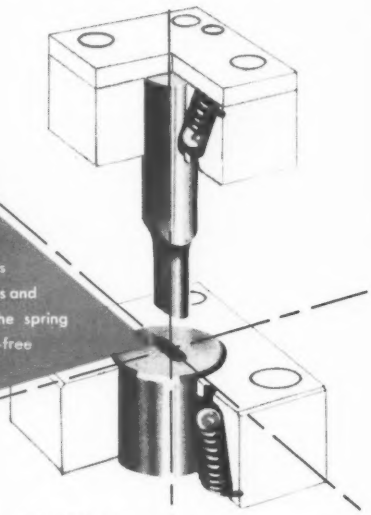
PORTAGE DOUBLE QUICK TOOL CO.
1046 Sweitzer Avenue • Akron 11, Ohio

Positive Alignment

with Standardized

R-B PUNCHES AND DIE BUTTONS

The R-B ball lock prevents radial or vertical movement in the retainer once the punch or die button is locked in place. Just a push, a twist and "click" the ball locks in the recessed portion of the R-B standardized punch or die button—no additional keying required. Special shapes and the largest sizes of standardized R-B punches and die buttons are kept perfectly aligned, by the spring loaded ball lock. You can be sure of trouble-free piercing when using standardized R-B punches and die buttons.



TOOL STANDARDIZATION IS THE BASIS FOR SAVING PRODUCTION TIME. WITH R-B YOU GET THE ACCEPTED STANDARD OF THE SHEET METAL INDUSTRY — IN STANDARD DESIGN FEATURES THAT SAVE IN ENGINEERING, DIE CONSTRUCTION AND OPERATION.

• *SEND FOR 52 PAGE R-B CATALOG*

RICHARD BROTHERS DIVISION
ALLIED PRODUCTS CORPORATION

DEPT. 67 • 12635 BURT ROAD • DETROIT 23, MICHIGAN

Also Produced in Allied's Four Plants . . . HARDENED AND PRECISION GROUND PARTS • STANDARD CAP SCREWS • SPECIAL COLD FORGED PARTS • SHEET METAL DIES • ALLITE DIES CAST OF ZINC ALLOY • JIGS • FIXTURES

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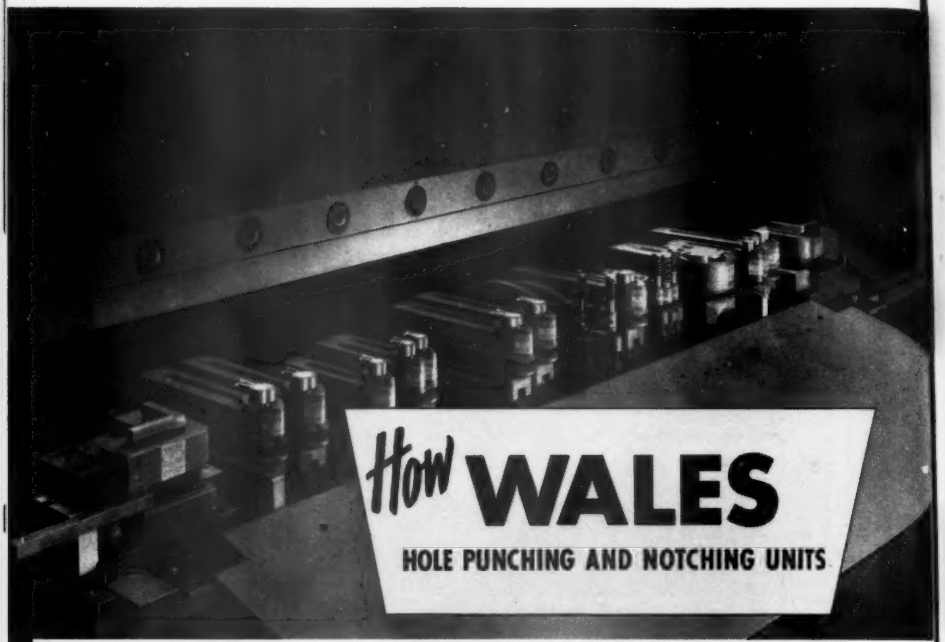
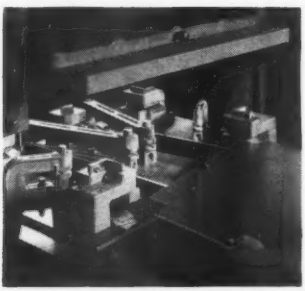


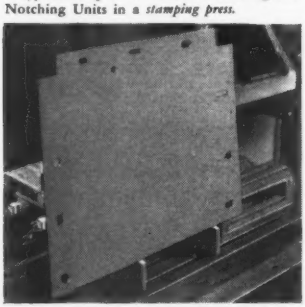
How WALES

HOLE PUNCHING AND NOTCHING UNITS

A typical *press brake* setup of Wales Hole Punching and Notching Units.



A typical setup of Wales Hole Punching and Notching Units in a *stamping press.*



Showing typical round and shaped holes punched by Wales Hole Punching Units. Note corners have been notched by Wales Notching Units.

MAKE FASTER, MORE ECONOMICAL SETUPS IN STAMPING PRESSES AND PRESS BRAKES

. . . *By eliminating* the time consuming operation of aligning each set of punches and dies.

. . . *By eliminating* special punches, punch plates, stripper plates, die buttons and die plates.

. . . *By eliminating* "dead storage" of setups and tooling investments—Wales Units drastically reduce setup and production time plus cutting initial and operating costs.

These tooling efficiencies are made possible by the *exclusive* independent, self-contained design that holds all working parts as a single hole punching or notching unit. A group of Wales Units may be set up in unlimited patterns and in many cases, put into operation the same day a pattern is released for production.

For the complete story on this faster, more economical production technique that has revolutionized tooling practice, write TODAY for fully-illustrated, functionally-colored Catalog BL and Catalog N.

WALES-STRIPPIT CORPORATION

George F. Wales, *Chairman*

355 Payne Avenue, North Tonawanda, N. Y.

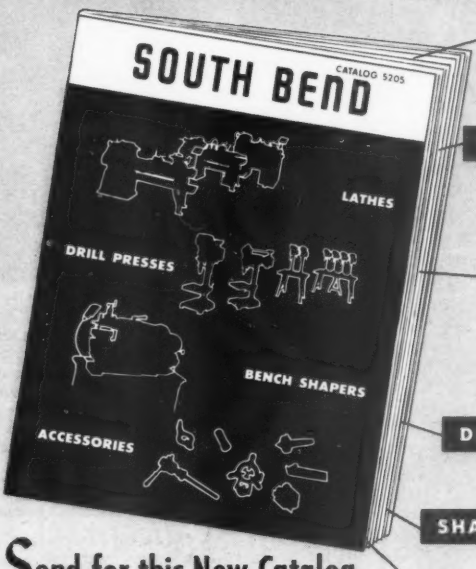
(Between Buffalo and Niagara Falls)

Wales-Strippit of Canada, Ltd., Hamilton, Ontario

Specialists in Punching and Notching Equipment

SOUTH BEND

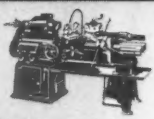
Lathes • Drill Presses • Shapers for *More Efficient Machining*



ENGINE LATHES

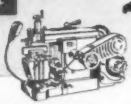
TOOLROOM LATHES

TURRET LATHES



DRILL PRESSES

SHAPER



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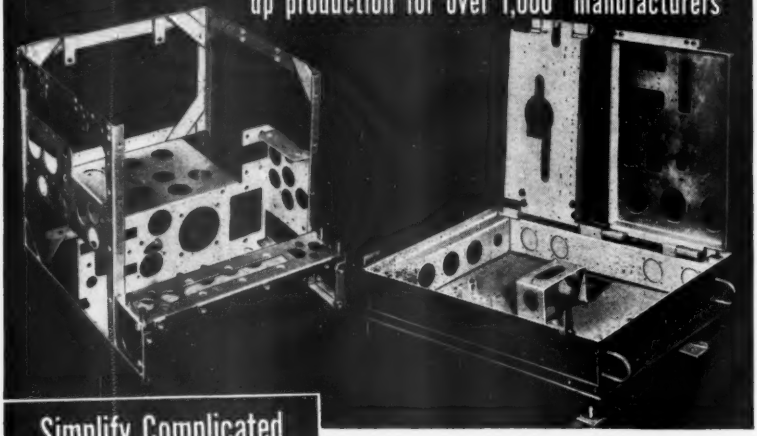

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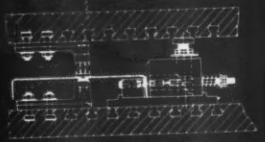

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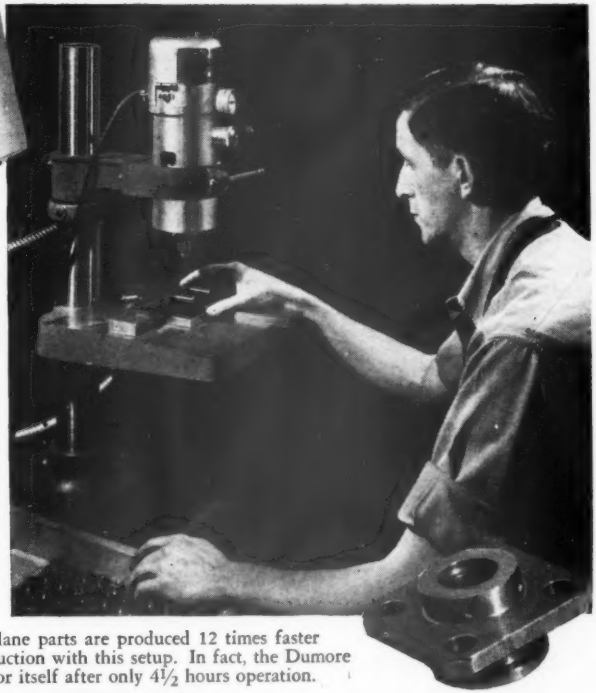

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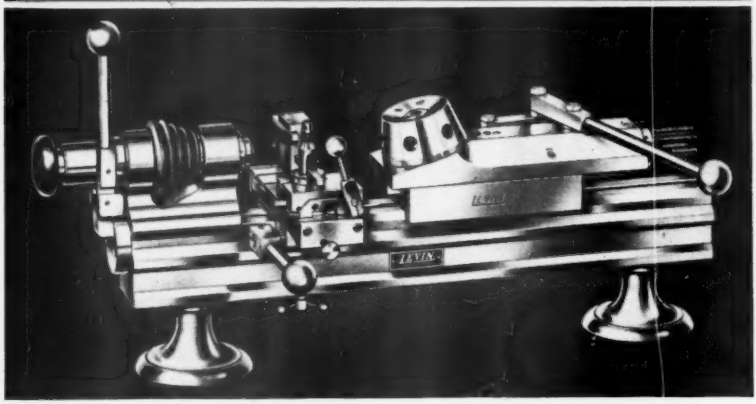

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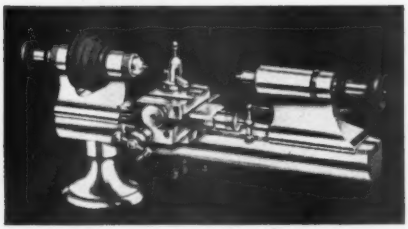

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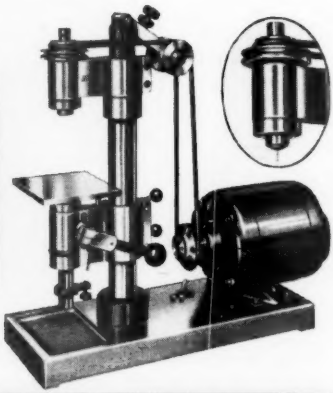

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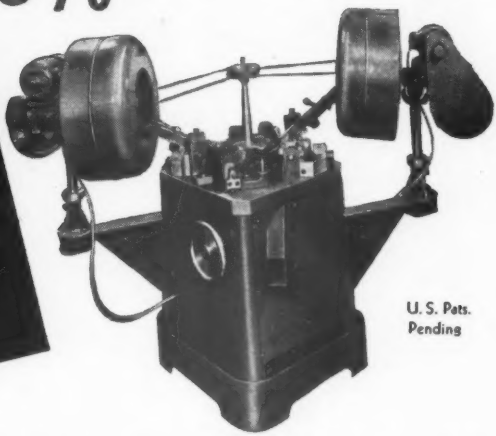

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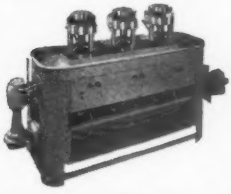

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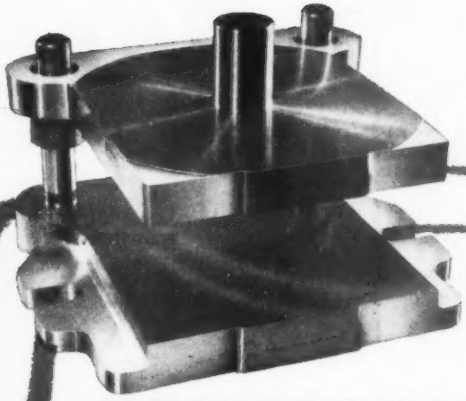

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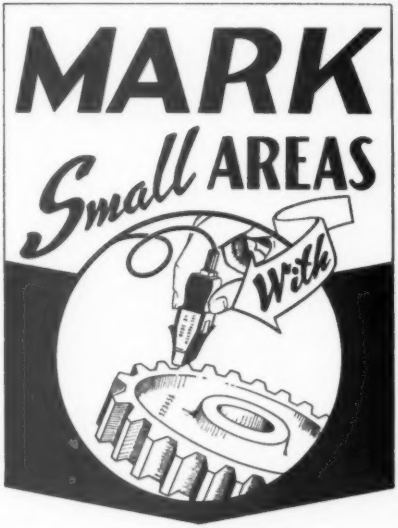

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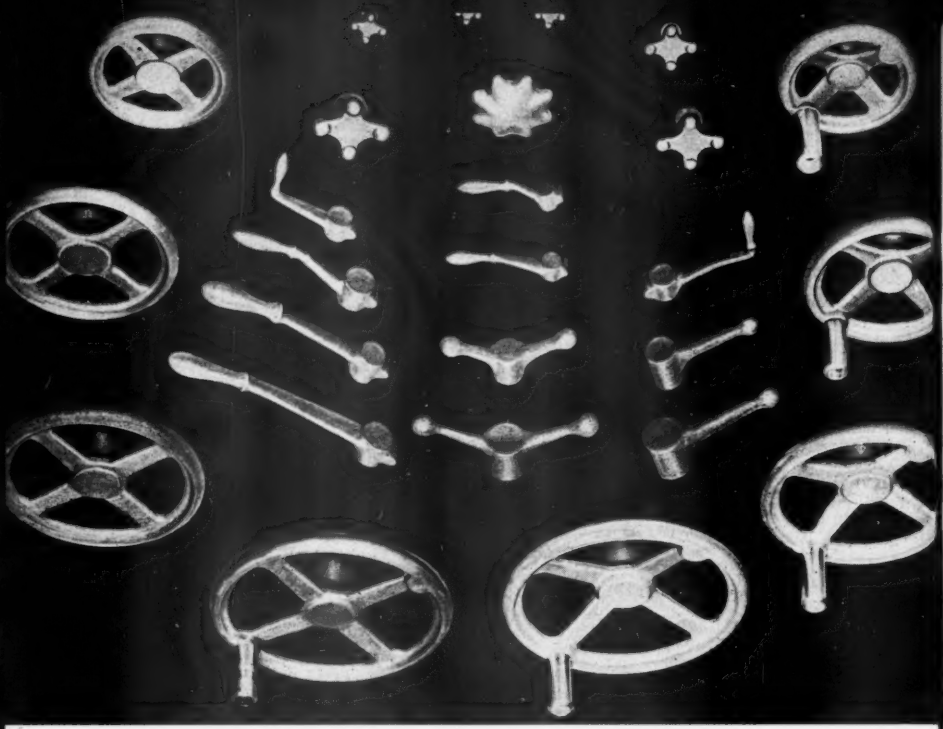

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the strategy of optics

One of the most critically strategic materials for military usage is optical glass, and yet the needs for optical glass, the production of optical glass, and the working of it into its products are among the least publicized of all the mutual problems of the military industry.

The ordinary peacetime demand for optical glass (cameras, binoculars, spotting 'scopes, microscopes and other laboratory instruments) amounts to about five percent of the requirements of an all out defense on war production program.

This is not too startling a disparity in itself because, after all, the peacetime utility of a Walker tank, for instance, is something less than zero. But when it comes to pass that our military needs call for tanks and optical glass products, the respective problems of material, procurement, facilities and fabrication lose any and all similarity. Wartime production of Walker tanks is not dependent upon an industry whose facilities, physical and human, represent but five percent of what is needed.

Physically, we get our tanks from established facilities which are comparatively easily converted from the production of automobiles and locomotives to that of armored vehicles.

And personnel-wise, it presents no problems to the skilled boring mill operator whether he is working to the workpiece blueprint for a turbine housing or a tank frame.

But when we must bump up our optical products output by many hundred percent on little or no notice we have to start from scratch; and how we scratched, optically, at the outset of the last war!

One too-little-told story of unsung heroes is that of the almost unbelievable job done by amateur telescope makers and optics hobbyists in breaking the optical components bottleneck that restricted the completion of desperately needed range finders, fire control instruments and bomb sights. Sparked by Pearl Harbor these craftsmen worked 16 and 20 hour stints in their basement shops and garages grinding prisms, correcting angles and generating flat surfaces to light-wave tolerances. At the time, our plight and their functions were restricted information of the nth degree.

It is very, very difficult to reduce many of the optics-making operations to a mechanized or mass production basis. Too many of the final touching-ups and corrections now have to be performed by hand, with the worker observing, testing and measuring as he goes. And, of course, as he nears completion the lens, mirror, or prism he's working on rises in value at a fantastic rate because of the disproportionate amount of direct skilled labor that has gone before.

Consequently, optics-making is of distressingly high "mortality" in scrap and rejects. This is evidenced by the virtually millions of dollars worth of optical elements that appeared on the consumer "war surplus" market after the last war; lenses, mirrors and prisms having chipped edges, scratches, internal strains, inadequate stock for finishing, and a variety of other mechanical and optical defects, "dumped" for a few pennies each.

This constitutes a challenge to the optical industry: to improve grinding and edging methods, to device tooling and fixuring that will replace hand operations, to revise inspection procedures so that inherent faults can be caught at earlier stages, and to minimize the frequency of handling. Once a finished lens or prisms, fragile as it is, is finally secured within its instrument housing it is quite well protected and will withstand surprisingly rugged use. It is prior to final mounting that the casualties are so high.

Any progress that can be made in optics-making techniques will serve to (1) bolster our military security, (2) lessen the optics industry's dependence upon relatively non-existent and difficult-to-train workers, and (3) give us many more, strategically critical, components from a batch of molten glass.

E. Willard Pennington

editor

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Automatic Work Holding Indexing and Positioning on Transfer-Type Machines

With countless and continuous improvements in machine tool drives, linkages, high speed spindles and bearings, automatic and centralized lubrication, carbide tooling, chip removal methods, and other phases of machine tool design and construction—actual machining time has been so speeded up that other elements of machine and cycle time have become infinitely more important.

by **Adolph A. Karrasch**
General Supt., Truck Engine Works
International Harvester Company
Indianapolis, Indiana

The multi-station, automatic-cycle machine was developed largely because of this need, and particularly to eliminate manual handling of parts between operations and to permit one operator to control numerous simultaneous operations.

The transfer-type machine is a multi-station, automatic-cycle machine designed specifically for conveyorized, straight-line continuous production. Usually these machines are characterized by successive pairs of opposed machine heads . . . each driven independently . . . but all interlocked by a conveyor or transfer mechanism which moves or indexes parts automatically from station-to-station. Conveyor and machine cycles are synchronized and controlled automatically from a single central panel.

Among the many problems faced—in the design, construction, and operation of such transfer machines—are those problems related to the handling of the workpiece. The part must be quickly loaded, automatically picked up at each station by the transfer or indexing mechanism and moved to the next station, accurately positioned for work at that station, positively clamped, and immediately unclamped when machining is complete.

Problems and hazards are magnified by the large size and/or complexity of most workpieces currently produced on this type machine. Most operations being of a percision nature, and with carbide tooling used wherever possible, movement of the workpiece under severe cutting pressures would be disastrous.

Sundstrand Cylinder Head Milling Machine

Several examples of successful work-handling methods are found among the various transfer-type machines being used in our plant in the manufacture of

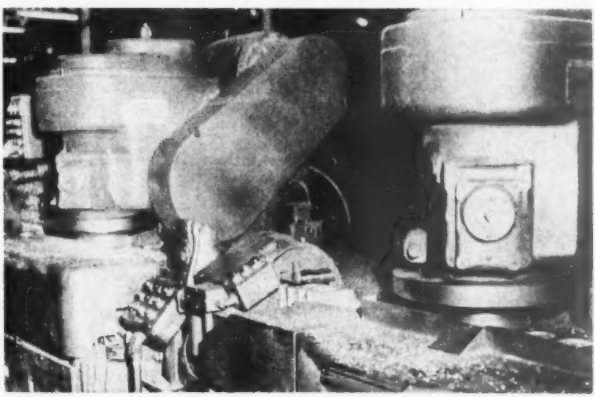


Figure 1. Sundstrand transfer type milling machine for cylinder heads. Stations 2, 3, and 4—shown from left to right—finish mill the valve cover surface and spark plug side, turn the head 180°, and rough mill the combustion face.

engines for International trucks. First of these is on a Sunstrand six-station machine especially designed and built for cylinder heads. See Figure 1.

The following operations are performed by this machine, which works at the approximate rate of one piece per minute:

Station No. 1. The cylinder head is placed in the machine and positioned for the transfer mechanism.

Station No. 2. A vertical spindle and a horizontal spindle, on one unit, finish mill the valve cover surface and the spark plug side.

Station No. 3. Head is automatically turned 180 degrees.

Station No. 4. Vertical spindle rough mills the combustion face.

Station No. 5. Horizontal spindle finish mills the manifold side.

Station No. 6. Head is removed from the transfer mechanism and machine.

Each station is equipped with its own hydraulic unit, which operates all the clamps at that station. A series of stops and limit switches operate the various unclamping, indexing, and clamping actions.

In the above sequence of operations, the indexing and turning of the head are accomplished simply but effectively. The vertical spindle and the horizontal spindle at Station No. 2 are combined in one traveling head. With motor-driven spindles, the entire unit is fed toward the load station, No. 1, by feed screw.

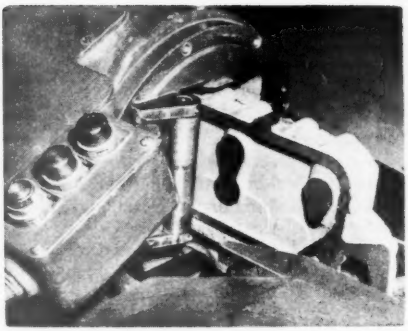


Fig. 2. Cylinder head positioned in the fixture is quickly turned 180°, in order to mill the opposite side in Station No. 4.

The feed screw is operated by two motors, one for the cutting feed and the other for rapid traverse. As the unit returns, it indexes the cylinder head to Station No. 3 by means of a spring loaded finger. Between the machining and the indexing, a magnetic brake functions.

After the cylinder head has been positioned in the turn-over fixture at Station No. 3 (Fig. 2), it is turned 180 degrees by means of a motor, gear and rack arrangement which is activated by a limit switch. When machining is finished on the preceding workpiece in Station No. 4, rapid traverse of the milling head in that station is used to pull the cylinder head from the turn-over fixture to Station No. 4, by a spring loaded finger.

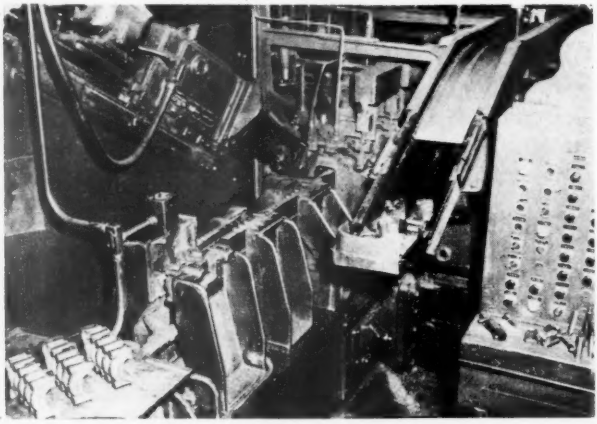


Fig. 3. Natco transfer machine for main bearing caps, shown from the operator's position. Parts start into the machine as a cluster and are returned to the operator as component parts.

Natco Main Bearing Cap Machine

Main bearing caps, starting as a cluster, are machined in a Natco 12-Station transfer machine, shown in Figure 3. Production rate is approximately one cluster or (4) pieces per minute. Prior to the work done here, the cluster has been machined on its sides, ends, and half round by broaching.

Operations on the Natco are as follows:

Station No. 1. Load cap clulster.

Stations No. 2 and 3. Idle.

Station No. 4. Drill (5) bolt holes in cluster, from a right hand horizontal head; and drill (1) angular oil drain hole in rear main bearing, from a left hand angular drill head.

Station No. 5. Drill (5) bolt holes in cluster, from a right hand horizontal head; and spotface the (5) bolt holes drilled at Station No. 4 and tap drill (1) oil pan mounting hole in rear main bearing, from a left hand horizontal head.

Station No. 6. Spotface the (5) holes drilled at Station No. 5 and chamfer the (1) tap drill hole, from a left hand horizontal head.

Station No. 7. Idle.

Station No. 8 Tap (1) oil pan mounting hole in the rear main bearing, from a left hand horizontal head; and cut bearing insert lock slots in the cluster, from a right hand horizontal milling head.

Stations No. 9 and 10. Idle.

Station No. 11. Saw the main bearing cap cluster into component parts, from a right hand horizontal milling head.

Station No. 12. Unload parts into an elevator, which places caps on a belt conveyor. Conveyor returns caps to the operator, who inspects them and places them in a tote skid, ready for the next operation.

In this machine, the cluster is indexed to each station by means of a hydraulic transfer bar with fingers. At the first machining station, the cluster is located at each end by retractable locators. All other stations locate the cluster by means of a retractable locating pin in a cap screw hole, which was drilled at the first machining position. The cluster is held in machining position at each station by means of hydraulic clamps.

Fig. 4. Finished bearing caps are elevated to a belt conveyor which returns the parts to the operator.

At the last machining station, the finished bearing caps are elevated to a belt conveyor which returns parts to the operator. Figure 4 shows this elevating mechanism, which is hinged so that a foot on the front contacts the belt conveyor guard rail, thus unloading the bearing caps on the conveyor. A spring retains the hinged carrier in a loaded position prior to unloading.

Ingersoll Cylinder Block Machine

The cylinder block presented numerous problems because of its large and cumbersome nature. Precautionary measures must be taken because of the tendency for such work to shift under severe cutting pressures. An Ingersoll 10-Station transfer machine is employed for the major operations on the block (or crankcase). Figure 5 shows the crankcase at Station No. 7.

Operations are performed in the following sequence:

Station No. 1. The crankcase is loaded into the machine and positioned for the transfer mechanism.

Station No. 2. Head surface of the crankcase is rough milled with one cutter mounted in a right hand horizontal unit.

Station No. 3. Idle. This station is one of several left open on the transfer equipment to facilitate tool changing, etc.

(Continued on page 86)

Precision Forging of Turbine Vanes, Blades and Buckets*

Precision forging of turbine vanes, blades, and buckets by advanced methods now under production development marks the basis for the facilities being installed by Packard Motor Car Co., in its Mt. Elliott Plant. According to the management, it is significant that this is the first mass production setup of its kind established by an automobile manufacturer.

by **Joseph Geschelin**

While awaiting the arrival of the many items of equipment required to complete the layout, Packard is producing these parts by conventional methods—in the main—and necessarily in smaller volume. Nevertheless, production has been established on a limited scale and will continue without interruption during the ensuing period of machinery installation and tooling.

It is the purpose of this article to provide a brief high-lighting of the operation, touching on the conventional methods being employed. Another study is contemplated later this year when the forging plant will be on a mass production basis.

*Acknowledgement: from "Automotive Industries", June 15, 1952. We are indebted to Chilton Publications' Editor James R. Custer for permission to reprint. The author, Mr. Geschelin, is Detroit Editor for "Automotive Industries".

Although a number of different blades and vanes are used for each machine, each one requiring a different set of dies and tools, the basic production technique remains the same. The stainless steel alloy used for blades and vanes is considered to be readily workable and does not pose the problems found in the making of buckets from high temperature resistant alloys. Nevertheless, the specifications for quality and fine surface finish demand complete freedom from scale in all stages of forging, and consequently involve special cleaning operations between formations.

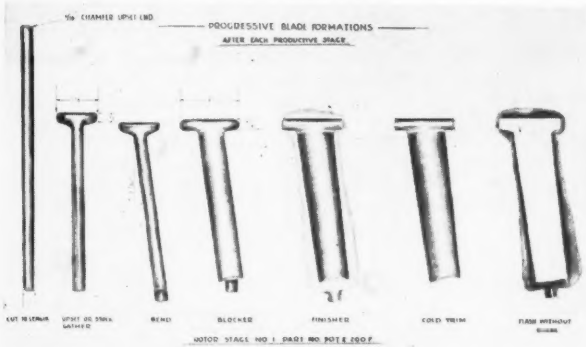
In addition, induction heating as well as the alternate method of Holcroft electric furnace heating with controlled atmosphere are essential to prevent formation of scale in the forging process.

Generally speaking, blade and vane fabrication involves five basic stages. The resulting product is true to size and contour and with excellent surface finish without further machining or grinding.

The five basic steps may be briefly summarized as follows, immediately below:

(1) Centerless-ground bar stock, received in random lengths, is washed and rinsed, cut to billet size. Centerless grinding is specified to assure the desired surface finish.

(2) The billet then is upset to develop the gathered end, using a Massey Harris



Typical of the operations required to produce blades and vanes at Packard is this series showing progressive blade formations.

Electro-Forge stock gathering machine and 125 ton Bliss press for restrike after stock-gathering.

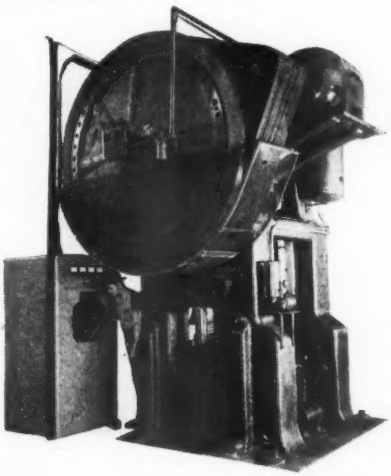
(3) Next is the stud-welding of the tong-hold onto the billet. The tong-hold is of selected carbon steel, the extra operation being amply justified by the saving in expensive and critical alloy.

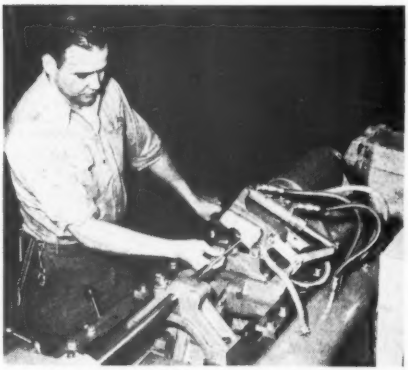
(4) The billet goes to a Wheelabrating machine for cleaning and then to 1300 ton forging presses of various makes, including Bliss, Ajax, and Maxipres for blocking. Billet heating for this operation is handled by induction heating, as illustrated in connection with the National Maxipres. Induction heating equipment is supplied by Tocco.

(5) Finish-forge and cold trim: The blocked forging is cleaned in an American Wheelabrator, finish-forged in another 1300-ton press, heated by electric rotary furnace — atmosphere-controlled. Cold trim is done on a 125-ton Bliss trim press.

This is followed by heating and quenching, heating and drawing, grinding the root-ends for Rockwell hardness tests. Heat-treating operations are performed in Lindberg controlled-atmosphere furnaces.

Step four in producing blade forgings is handled in a number of different press setups, the one shown here being a 1300-ton Maxipress. Billets are heated in the Tocco induction heating unit, seen at left.





The Massey-Harris electro-forge stock gathering machine which provides the second stage in the making of blades and vanes. The operator is placing the billet in the fixture. The hydraulic ram is the bar to the left; the inductor is at the extreme right.

The last major step in this sequence is a cold restrike in a 2000-lb Ceco hammer. This is followed by Magnaflux inspection and final inspection.

Step 2, mentioned above, employs the Massey-Harris Electro-Forge stock gathering machine, illustrated here. This unique piece of equipment is of British origin, made in Canada. Its major features are the hydraulically-actuated ram and the tail stock which carries the gathering die. The billet is guided by means of a clamshell bearing to the right of die and is heated to forging temperature by an inductor at the die. Hydraulic actuation of the ram is automatically controlled as to pressure and rate of feed by means of Vickers controls.

Bucket fabrication is more involved and demands additional steps as well as extreme care in handling because of the greater difficulty in forging the special high temperature resistant alloy. Control of scale becomes more of a problem and cleaning is employed, not only to remove scale, but to afford better detection of surface defects.

Buckets are produced in a different type of equipment, heavier in tonnage for all forging operations, and require six major stages of fabrication as follows:

(1) Wash and cut centerless-ground bar stock to billet length.

(Continued on page 78)

Cold Forming of the Stainless Steels

Continued*

Group III

Shallow and deep drawing of the stainless steels is one of the most frequent utilized operations occurring in press working; this type of operation stressing the metal under tensile loadings beyond its elastic limit, but within its ultimate strength. High compressive stresses within the part formed will result, aiding in the production of large unit deformations, but resulting in other types of difficulties such as wrinkling, cracking, etc. This type

by **Lester F. Spencer**
Chief Metallurgist
LANDERS FRARY & CLARK
New Britain, Conn.

of operation is performed in either a mechanical or hydraulic press; the form being produced by the use of die components.

The components of a die set-up for drawing stainless is illustrated in Figure 13; the force of the punch exerting a constant pressure on the blank and forces it down into the bottom die to form the desired section. In a procedure involving deep drawing, i.e. of a cylindrical shape, this pressure exerted by the punch will cause compressive stresses in the peripheral direction in the rim of the blank and, at the same time, tensional stresses along the side walls. The compressive stresses will tend to wrinkle or buckle the rim of the blank, however if the draw is comparatively shallow, this may be eliminated by the ironing action in that gap between the punch and the die. On deeper draws, a hold-down ring is employed; the pressure of which can be adjusted in accordance to the requirement of the specific job. However, if this blank hold-down pressure is too high, breakage will occur in that the bottom of the partially drawn shell will punch out before the draw operation has been completed.

Single action presses are used to a limited extent in drawing of the stainless steels; the hold-down action being performed in this type of equipment by either pneumatic, hydraulic or spring cushions. However, in deep drawing procedures, a double action press is the preferred in which the blank is held more or less tightly for the duration of the draw. It will be evident that the success of a drawing operation will hinge on (1) the ductility of the material to be drawn, (2) the limitation of the drawing punch force, and (3) the adjustment of the blank-holder pressure.

The punch determines the contour of the drawn section; the radius of this punch being quite important. Thus, insufficient radius may cause rupture of the metal at that point, whereas too large a radius may cause puckering, this being particularly true on light gage material. The die component is usually a narrow ring that permits the section to be pushed through to the pre-determined depth. Here again, if the radius of the draw ring is too small, excessive work hardening will be realized and may ultimately result in rupture before the draw has been completed. Conversely, if the radius is too large, excessive wrinkling may occur. The recommended radius of the punch is usually given as four times the thickness of stock to be drawn, while the radius of the die ring is usually stated as four to eight times the thickness of the stock to be drawn. Any trimming allowances is usually left on the

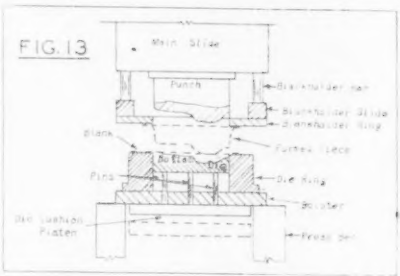


Fig. 13. Components of a HPM Fastraverse press, showing the die setup for drawing stainless steel. The force of the punch exerts a constant pressure on the blank and forces it down into the bottom die to form the desired section.

*See page 62, Tooling and Production, August, 1952.

top of the section as either a flange or as a continuation of the straight sided wall. The ejector pad may emboss the bottom of the shell formed or it may even perform a shallow reverse draw.

Other factors to consider in the drawing of the stainless steels is that of the edge condition, clearance and press speed. In the former mentioned factor, edge condition is of prime importance in the austenitic alloys in that the pressence of a burr may cause sufficient work hardening to cause stress cracking. In addition, the dies may be irreparably harmed by the scratching or gouging effect of this burred edge as it is slid in between the die components for forming. A press speed of from 30 to 50 f.p.m. is usually recommended for the austenitic alloys so to minimize work hardening; both the ferritic and the low carbon martensitic can be drawn at faster speeds. About twice as much clearance is required for drawing the stainless as that usually required for the mild steels, however this factor will vary in accordance to the thickness of the stock to be drawn. Also, clearance will vary in proportion to the degree of ironing that may be desired. The power requirements are greater than that required for the mild steels; this being particularly true of the austenitic steels.

In a sequence of operations involving deep drawing, it is recommended that the supplier be notified so that the material purchased will have the mechanical characteristics, cleanliness and grain size so as to insure success in deep drawing operations. In the latter property mentioned, a too large a grain size will cause an 'orange peel' effect which may require excessive polishing if removal is desired. Conversely, a too small a grain size may detract from the ductility of the material. Usually, a grain size of from 0.030 to 0.035 mm is usually desired and it is imperative that this grain size be maintained throughout processing and not damaged by uncontrolled inter-stage annealing operations.

(Continued on page 74)

Photo courtesy The Hydraulic Press Mfg. Co.

Fig. 14. Press drawing on a hydraulic blankholder press. The workpieces show a neat decorative design and the type of drawing which can be performed on stainless steel in this press.

Tool Guide Bushings for Multi-Station Machines

The use of tool guide bushings in multiple-station machines varies only in application from simple jigs and single spindle operations, retaining the same function of holding location and size within specified limits. Consequently, it is necessary to first consider the basic factors involved in the selection and use of guide bushings.

by **R. E. Tasch**
Chief Engineer
BUHR MACHINE TOOL COMPANY
and **E. J. Lipa**
Engineer
GATCO ROTARY BUSHING COMPANY

Tool guide bushings are of two types, fixed and rotating, each having its advantages and limitations.

Fixed type bushings (Fig. 1) are used under the following conditions:

A. On formal operations not involving restricting high speeds or close tolerances.

B. Where space restrictions are involved, such as close center distances.

C. Where tool support must be very close to the workpiece (Fig. 2).

Rotating type bushings (Fig. 3) are used:

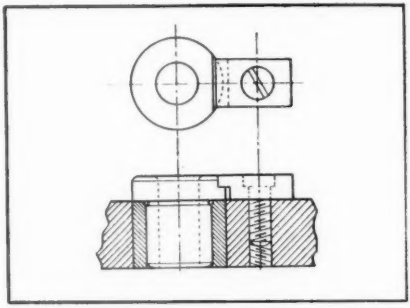


Fig. 1. Conventional fixed bushings are used where center distances are close and wherever special requirements do not require the rotating type.

A. Where tools are to run at high speeds.

B. When close limits must be held on location and size.

C. When operations such as squaring up surfaces before drilling are encountered (Fig. 4).

D. When the bushing is to be used as a stop for actuating tools, such as in the case of recessing.

The advantage of the rotating type at high speed is of course due to the anti-friction bearing transmitting the radial

Fig. 2. On certain operations, tools must be supported close to the workpiece. Fixed bushings are used here.

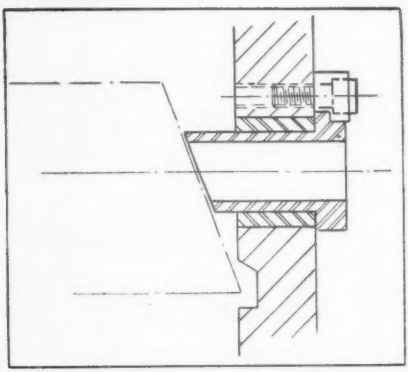
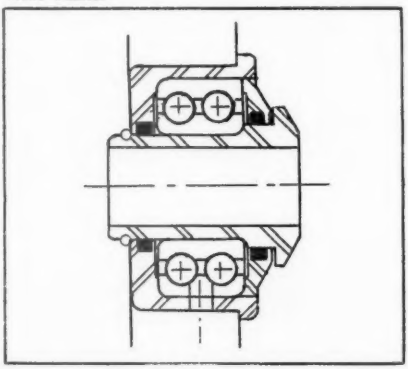


Fig. 3. Rotating type bushings are effectively used where tools operate at high speeds and where location and size of holes must be held to close limits.



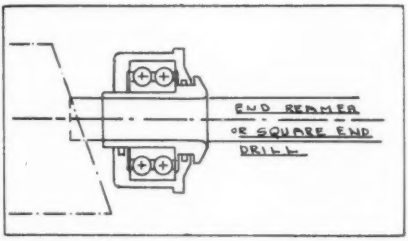


Fig. 4. Where surfaces must be squared up before drilling, rotating bushings should be used because of the unbalanced cutting forces.

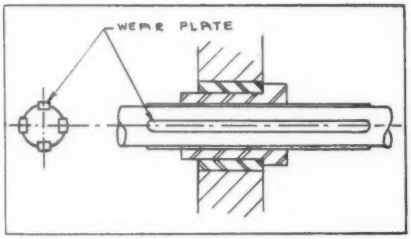
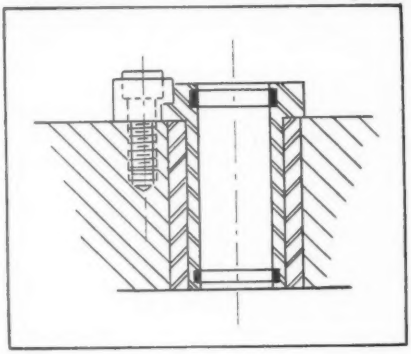


Fig. 5. Wear strips applied to the tool shank permits using fixed bushings for higher speeds.

Fig. 6. Carbide inserted bushings are commonly used where severe wear conditions are expected.



load while the tool bearing area is subjected only to the linear motion. This also points out the life advantage of the rotating type, since the tool-bearing area of the fixed bushing is subjected to both radial and linear motion. This advantage is furthered, in the case of the rotating type, by having the anti-friction bearing sealed from dirt and coolant.

The rotating type of tool guide bushing also offers an advantage in accuracy. Due to its long life, this type of bushing is normally mounted directly into the bore of the bushing plate with a .0005 to .001 press fit, depending upon size, and with .0002 to .0005 tool clearance—thus providing a slip fit between the tool and the tool-bearing area of the bushing.

The fixed type of tool guide bushing must, on any production work, be used in conjunction with a hardened liner in the bushing plate in order to facilitate replacement due to its much shorter life. The liner is pressed into the bushing plate, and from .0002 to .001 clearance allowed between the liner I. D. and the bushing O. D. From .0003 to .0007 clearance is allowed between the tool and the bushing I. D., thus having the required running fit. The above limits are for bushings of from ⅜" to 1" inside diameter, the differential in accuracy becoming more pronounced in the larger sizes.

The utility of the fixed type tool guide bushing can be improved to meet special conditions. Figure 5 illustrates the addition of hard-bronze wear strips to the tool, permitting higher speeds with less possibility of seizure. Carbide inserted bushings, shown in Figure 6, can be used where severe wear conditions are anticipated.

Unlike the stationary type of operation where the workpiece can be loaded, located and clamped in a fixture containing the tool guide bushings, the multi-station machine moves the workpiece through the machine in sequence. Although this provides the ability of doing a series of operations on the same hole, it requires that the tool guide bushings be carried at the individual stations, with the proper relationship between the guide bushings and the workpiece being established after the workpiece is brought into that working station.

The typical problems of tool guide bushing applications in multi-station machines are best illustrated in a vertical dial type machine. Here the workpiece, held in a fitxure, is indexed station to station around a circle in a horizontal plane. The cutting tools approach the workpiece from above, in the vertical plane.

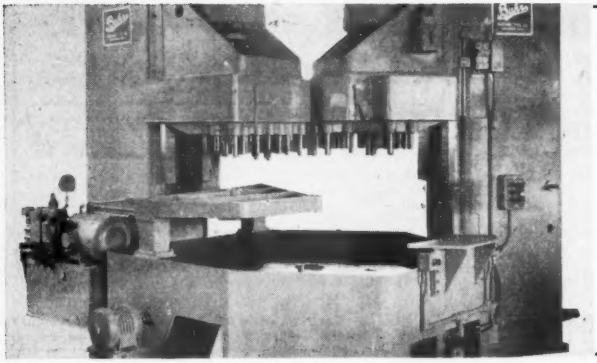


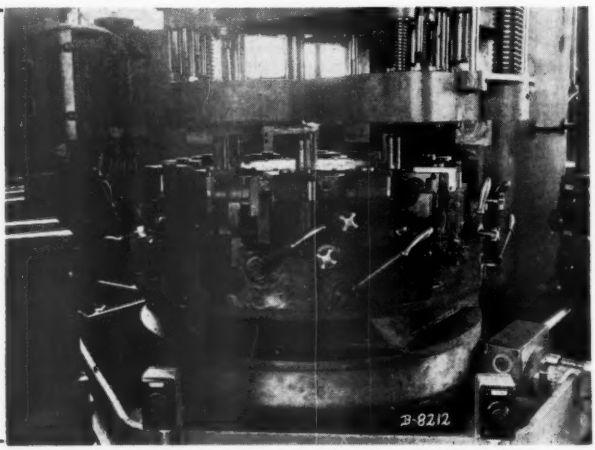
Fig. 7. Under certain conditions, guide bushings can be carried in a solid plate mounted to the machine bed. The fixtured workpiece then indexes under the plate, with alignment assured by a shot-bolt device. This method has various limitations.

The following three methods of carrying the tool guide bushings might be considered, although the nature of the workpiece, fixture, or machine might dictate the method and eliminate the possibility of a choice.

A. The use of a solid bushing plate mounted to the machine bed (Fig. 7). The workpiece is carried under the plate by an index having a shot-bolt to assure location at the working stations. Alignment is difficult due to the number of components, and the other methods normally produce better accuracy. There are further design restrictions to this method which are not contingent upon the tool guide bushings.

B. The use of a master bushing plate covering all of the working stations that require tool guide bushings (Fig. 8). The plate is suspended from the head with lift rods and held in alignment by means of guide bars. Final location of the bushing plate during the work cycle is achieved by registering it over pins, one of which is provided in each fixture. The accuracy of this method is influenced mainly by machining tolerances required on the bushing plate due to size, and by fixture mounting error.

Fig. 8. All bushings being carried in master plate suspended from the machine head. Plate registers over pins, one in each work fixture. Accuracy becomes more difficult to hold with increase in size of plate and number of fixtures.



C. The use of individual bushing plates, each of which hold the tool guide bushings for one working station. (Fig 9). The plates are carried from the head by combination guide and lift bars. Each plate is registered by two pins to the fixture at its working position. This method eliminates any accumulative error in the machine, and its accuracy is limited only by the machining tolerances of the small plates.

The above methods may of course be modified to suit a given application. A good example of this often occurs on transfer type machines where individual bushing plates are used; but, due to the part being sent through the cycle without a fixture, the bushing plate is registered on pins in support brackets mounted on the machine bed.

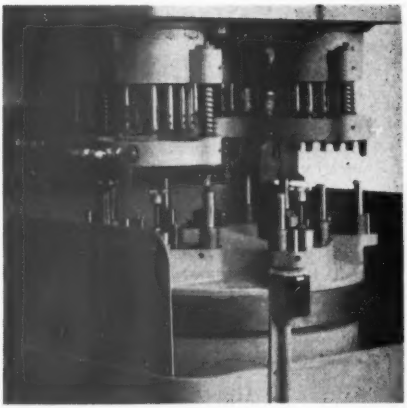


Fig. 9. Individual bushing plates, each holding the tool guide bushings for one work station, are supported from the head and registered by pins to the fixture in its working position. This method eliminates accumulative errors.

$139,302 Pay-off in Westinghouse "Suggestion Sweepstakes"

Gerald W. Gunnell, an employe of the Transportation and Generator Division of the Westinghouse Electric Corporation at East Pittsburgh, Pa., won $2,000 of the $139,302 shared in 1951 by about 9,000 employes whose ideas were turned into production methods in the "Suggestion Sweepstakes."

H. T. McLaughlin, Supervisor of the Westinghouse Suggestion Systems, said Mr. Gunnell received the top award for suggesting that two inches be added to the length of large sheets of mica, thus permitting the cutting of eight pieces of the insulating material instead of six and reducing the scrap produced in the operation.

It was this kind of thinking also that resulted in the award of $1,305 to Anthony Cucchi, who figured a way to arrange a die so that 11 extra pieces could be stamped from a standard sheet of mica. The adoption of his idea brought about a production increase of nearly one-third.

A number of other awards, amounting to more than $1,000 each, was made to employes in Westinghouse plants in East Pittsburgh, Irwin and Sunbury, Pa., Baltimore, Md., and Cleveland, O. More than 400 awards of $50 and above went to thinking employes at these and other company plants.

Not all of the awards were made to individuals. In the case of two Cleveland plant employes, it was teamwork that paid off. Louis Gehm and Joseph Voytko are $1,250 richer for suggesting that a machine be used in the manufacture of packing pads and similar items. This resulted in better inventory control and reduced the cost of packing materials. Another joint award worth $1,181 was won by John Storer and Richard Bell, both of the Switchgear Division at East Pittsburgh. These men discovered that their division was erroneously being over-charged on the cost of a certain type of ceramic material.

An idea for a better method of packing television and radio receivers won an award of $1,050 for Wilson Mottern of the Sunbury plant. This was a supplemental award for Mr. Mottern who had been paid $325 for this suggestion in 1950. Because additional savings were achieved last year, his total award now comes to $1,375.

Similarly, Ralph Gruver of the Baltimore plant was awarded $1,027 in addition to the $1,342 he received in 1950 for his suggestion that Westinghouse make its own packing labels instead of buying them.

Mr. McLaughlin pointed out that more than $1,500,000 has been paid out in suggestion awards since the system was established in 1910. During that time, he said, more than 364,000 suggestions have been received and, of these, nearly 129,000 have been adopted—or about 35 percent.

Employe participation in the Suggestion System increased from 11.2 percent in 1950 to 14.5 percent in 1951 when a total of 13,460 employes submitted 24,390 suggestions, of which 8,694 were adopted. The average award per adopted suggestion amounted to $16.02.

The largest single award ever made was $5,085 to Aloysius Estadt in 1948 when he suggested processing mica by machine instead of by hand.

Magnetic Piercing Equipment An Asset to Job Simplification

Here at Hickok we are engaged primarily in the development and production of electronic test equipment. Due to rapid technological change, we must maintain extreme flexibility in our tooling. Short runs and extremely short life of a particular version of a test unit makes permanent tooling out of the question. No appreciable inventory of even a standard model can be maintained, and production runs seldom exceed 200 units.

by **George Perz**
Chief Industrial Engineer
THE HICKOK ELECTRICAL INSTRUMENT CO.
Cleveland, Ohio

The step punching method that was previously used to pierce panels and chassis, appeared at first to be the most economical way to produce these parts. Actually, we found that it could become quite costly.

The front panel that is used on most of our testers is aluminum with a satin finish and etched background. Paper separators are used between the panels to protect the surfaces from being defaced. The possibility of marring is present each time a panel is handled. The step punching method required numerous handlings of the panel thereby increasing the risk of defacement.

Many of our panels have circular scales etched into the face of the metal. For full visibility of the scale and accurate reading of it by the test operator, extreme accuracy is necessary in locating the hole into which the indicator is mounted. With the step punching method, the combination of back and side stops can become very confusing, causing good press operators to hesitate from time to time even though they had established a set procedure. Too often, the accurate locating of holes that must line up with mating parts left much to be desired.

When we first looked into the possibility of using universal multiple-piercing equipment and, specifically, of adapting Whistler magnetic equipment to our needs, the cost appeared to be as prohibitive as permanent tooling. Closer analysis indicated that the 80-ton Sturdybender press brake, equipped with flanges

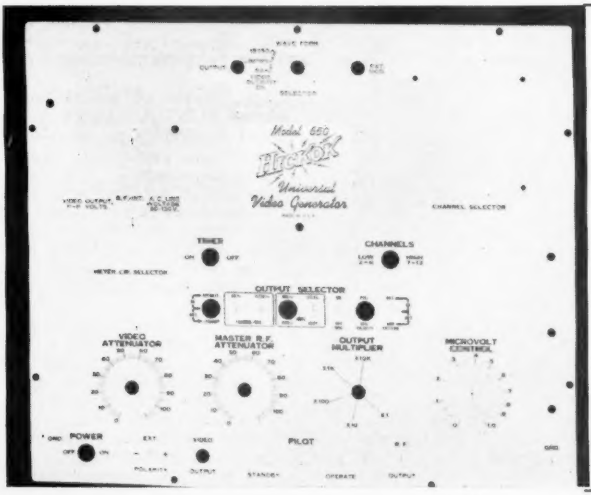


Fig. 1. Semi-finished generator face panel of satin finish aluminum is accomplished by two hits on the press brake. Panel is photographed over dark background to emphasize those holes already punched.

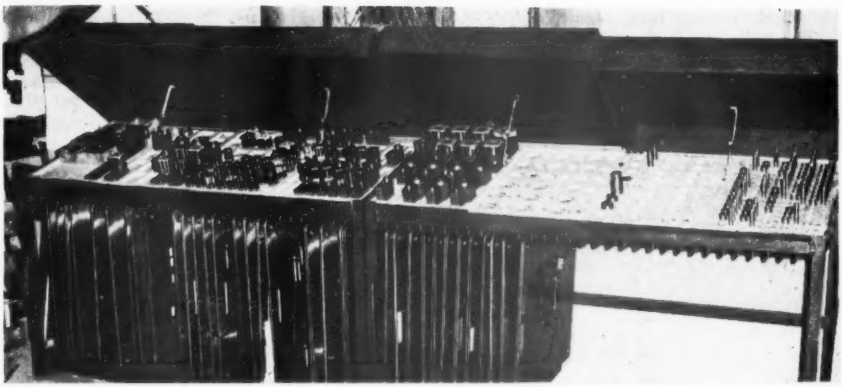


Fig. 2. Current storage space for standard retainer units and individual job templates. Relatively small inventory of universal tools will take care of major requirements. Interchangeable punches and die bushings can be seen at upper right.

to permit mounting three die sets, would actually be a capital investment. In addition, all standard retainers, punches, die bushings, and strippers could be amortized over the estimated number of units to be built in a given year.

The only costs that would be chargeable against a particular unit were: layout time, cost of standard template sets, jig boring time, and such special tooling as would be required for odd-shaped holes, for example. In time, a good deal of this so-called special tooling has become standard equipment because our engineers made further use of it wherever practical.

Our Model 650 Universal Video Generator panel, Figure 1, is a prime example of the gains we have attained. On the 3/32" aluminum panel, we are piercing 58 holes in 5 operations where formerly 18 separate handlings were required.

In addition to speeding up the delivery of finished panels, on this particular model we have achieved a net reduction of 34 hours per thousand units in direct labor costs. The reduction in the number of operations also reduces the number of times a panel is exposed to possible damage.

The Whistler process calls for using a matched set or pair of punch and die bushings for each hole to be pierced. Each member is held in a retainer that incorporates an Alnico permanent magnet. Tools are then held magnetically to die set plates or shoes, rather than being screwed, bolted, or clamped by conventional means. This permits the same basic die set to be more or less permanently mounted on the press or, in our case, the aforementioned press brake, and it will accommodate nearly all panels and chassis plates we might encounter.

A relatively small inventory of standard units, Figure 2, in combination with individual job templates, will adapt the basic die set to many different piercing arrangements.

All punches and die bushings of the same size are interchangeable within their respective retainers, and they are self aligning when retainers are properly mounted. Center distances are maintained by locating individual members in rigid metal templates. On any particular job, a pair of templates—one for the upper set of tools, the other for the lower set—are clamped together and precision jig-bored to accommodate punch and die units. On any hole therefore there can be no danger of misalignment.

Two die sets we normally use, Figure 3, are back post mounted and easily accommodate nearly all of our current panel sizes. Our maximum commercial panel is 13" x 16", while the maximum special panel is 24" x 26". Elimination of front posts or leader pins on the die sets not only provides greater access to the tooling

(Continued on page 100)

. . . Cold Forming, from page 67

The limit to which a shell can be drawn is difficult to state since such factors as material, punch radius, die radius, thickness of stock, permissible percentage of wall thinning, etc. will affect this value. Within the austenitic stainless group, type 302 stainless is usually employed; a No. 1 or dull pickled finish of this type analysis may have from 40 to 50 percent permissible reduction before inter-stage annealing is required. As mentioned previously, type 305 has proven to be superior to type 302 in regard to precentage of re-

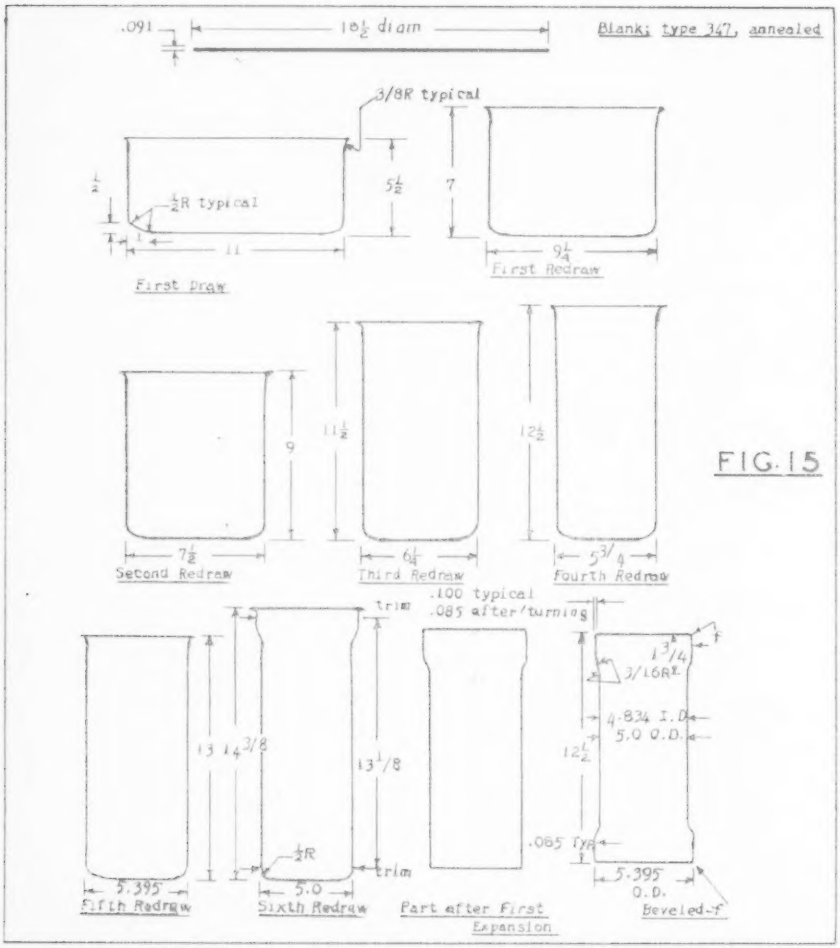


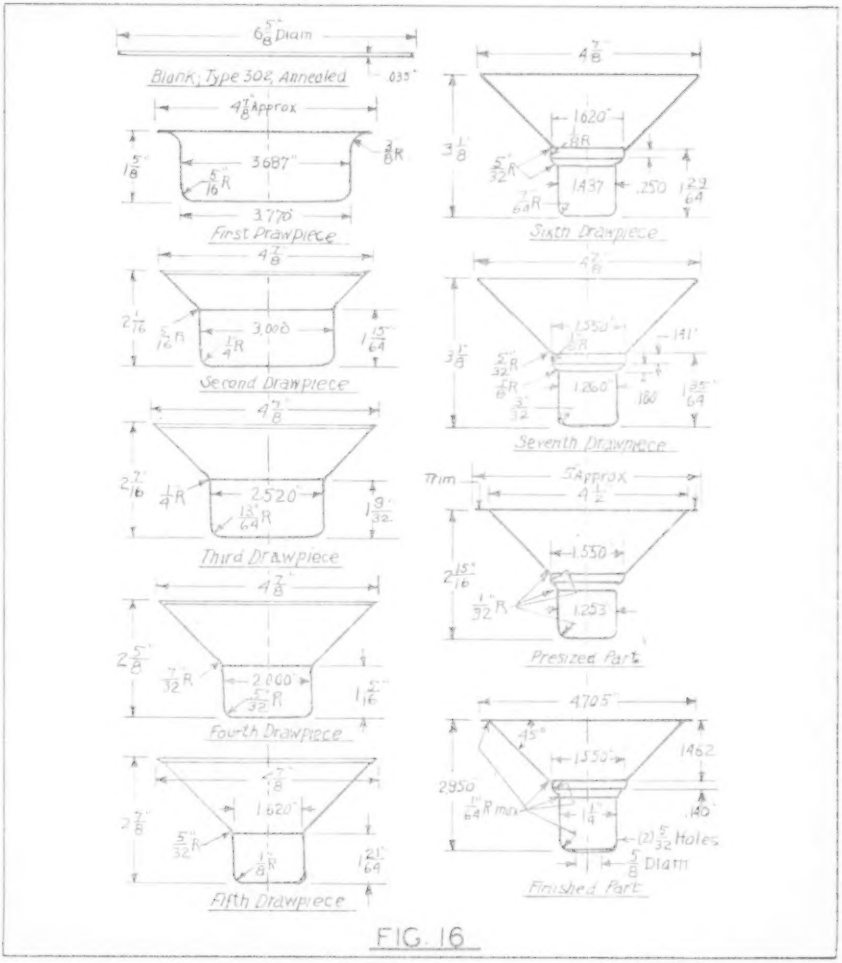
FIG. 15

Drawing courtesy International Nickel Co., Inc.

Fig. 15. A draw sequence of a tubular part made from type 347 stainless is illustrated. The equipment used on all draw sequence being a double action hydraulic press with 250 tons available on the punch and 100 tons available on the hold-down. (Ref.[1]).

duction, the extra cost of material being widely overcome by the savings realized in the elimination of operations such as heat treatment for annealing and pickling. Both type 321, 347 and 301 stainless have definite limitations which has been mentioned, however, it is well to note that although type 301 will draw well upon initial cupping, successive re-draws will realize less deformation between the anneals. In addition, this alloy will have a greater tendency toward wrinkling due to its higher strengths and that stress cracking may likely occur at considerable lower reductions than do the higher nickel types.

(Continued on page 90)



Drawing courtesy International Nickel Co., Inc.

Fig. 16. Illustrated is the type of reduction where a maximum of approximately 45 to 55 percent is taken in successive draws before the first interstage anneal is taken. (Ref.[1]).

Pressed Metal Institute Third Annual Technical Meeting

Continued*

Adjustable Dies

Mr. Rumbarger then took up the subject of adjustable dies.

"Generally speaking, adjustable dies, as I see it, do not completely fit into the short run field, as we ordinarily think of short runs. Primarily we deal with square sheared blanks, punched, notched to some extent, formed, louvers and lances.

"A great many plants have made their own adjustable dies. A great many of them in turn have come to purchase dies that are made now on what is known as standards.

Reported by
Carl F. Benner
Assistant Editor

"We don't operate in a particularly heavy field. Primarily, we operate in the sheet metal field, rather than the plate field, the ¼ inch, ⅜ and possibly sometimes ½ inch.

"My experience in the last ten or twelve years in this particular field has told me that we could practically forget everything above ⅛ inch and probably cover 99.9 per cent of everything that is done.

"Also, it might be noted that about the same proportion will hold for the holes, ½ inch in diameter and under.

"We could manufacture punches and bushings and retainers for parts to go up as high as ½ inch in thickness and probably cover the entire field on which we can make some money. When we get above that, we lose our shirts.

"I think somewhere between what they call short run, as HPL, Dayton Rogers and those people that make them, we get somewhere above that.

"The tendency has been that what was originally termed short-run dies, adjustable dies have become actual production tools.

"I have found many cases where there is a tendency to definitely pit us against the die maker, that is, the conventional die maker. For instance, in Cleveland we have about 145 tool, die, and gage shops, I believe. Pricewise, they will generally take the adjustable die manufacturer, because a die set has to be supplied with some kind of plate or something like that.

"On the other hand, if there are three or four stampings involved—and in many cases where you have various models involving maybe 10 stampings or more—the chance is pretty good that the adjustable dies will win out.

"Also, there are certain advantages, we think. You have a limited investment per part, to begin with. The reuse of the tooling, of course, is self-evident. They are adjustable. In other words, they are not the rubber dies we all hope for, and I am not speaking of those we just heard discussed. As you know, with government works and various things, everybody wished he had a die he could move an inch or two to take care of constant changes coming through. They don't seem to want to freeze anything.

"The replacement of the wearing parts, of course, is very necessary, and that, of course, is the heart of the investment. Standardization has progressed through the years, generally speaking, so that if you purchased a tool ten years ago in the adjustable die field, today you can get a replacement and get it so that it actually fits. It is accurate. More so than it was five years ago. But it is standard.

"They fit in both the short and the long run category. The tendency is to use them for short run tooling, and then I believe that in most cases they feed over and over, and they become a long-run proposition."

Questions and Answers

"Question: "I noticed that you have both the magnetic type and the type

*See page 66, Tooling & Production, August 1952.

which has the slotted shoe. Why was that developed? Is there a difference, a great difference in setup time or in permanence? Which one is best adapted to the shortest run, and which is best adapted to something that would be more or less of a medium run?"

Answer: "Magnetic tooling was brought out for two reasons. One is that it does simplify the setup and primarily it cuts down press time. The removal of two templates, in which the tooling, of course, is inserted, is only a question of minutes. On the other hand, it eliminates to a great extent die setting, as it is known. I might say this, that your accuracy is obtained through your jig boring or some type of procedure for milling the two templates together. The tools can be inserted by unskilled labor, and the only time involved in press down-time is removing the two plates with the tools in, let's say, that are in the master die set, the other two being put in. There are no bolts or no nuts involved. There are a couple of thumb screws there on the jig post.

"Another thing is absolute accuracy. You can be just as accurate as on the custom die, because your jig board gives you the accuracy. Punches and retainers and that sort of thing are generally held to tenths.

I would say that you do have absolute accuracy. You eliminate considerable cost involved in die setting, and you can use unskilled labor. You can repeat over and over and over and every one will be the same.

"I would say that you do have absolute accuracy.

"In the other type of tooling you have setup time that probably runs five or six minutes per unit. If you set it up once a year or quarterly, it probably is a better unit to have than the other. It depends on the accuracy. It depends on how much repetition is involved in setting up. In other words, each job has to be tailored to fit your job."

Question: "Mr. Rumbarger, let's hear about the cost of the adjustable die unit. Say a company is starting from scratch. They don't have any background. They want to start using your Whistler setup or a Wales-Strippit setup. Are they, incidentally, approximately the same cost?"

Answer: "Pretty much so."

Question: "What is the original investment and what happens thereafter?"

Answer: "Well, it depends. It is pretty hard to nail that down. It depends pretty much on the type of work you are doing, the amount of production, particularly the production angle. There are a number of machines, such as Wiedemann, and also tooling made by Richards Bros., and so forth, which can do single-hole punching jobs and that sort of thing. They do cater to the die maker, but if you have, let's say, 50 parts to make, I think it is a tossup as to whether you would use adjustable dies, even if you had them, and set them up against maybe some O.B.I. presses in which you had individual punches. You have to balance the gage cost, cost of setting up a gage and locating that part, against the time that is involved in setting up, shall we say, adjustable dies.

"On the other hand, if you have 100 pieces, you generally, if you do not have too much press-down time involved, can make it worth your while.

"I think you have a very limited investment per part, on the overall picture, in any kind of adjustable tooling, and your adjustable tooling today is of such manufacture that it can compete with any type of conventional die. Most of your punches are alloy, and without question, the stainless steel you can find available for high speed and high carbon purposes—I would say it would be a very good investment. On the other hand, it depends on the type of work the plant does. We have to tailor those jobs."

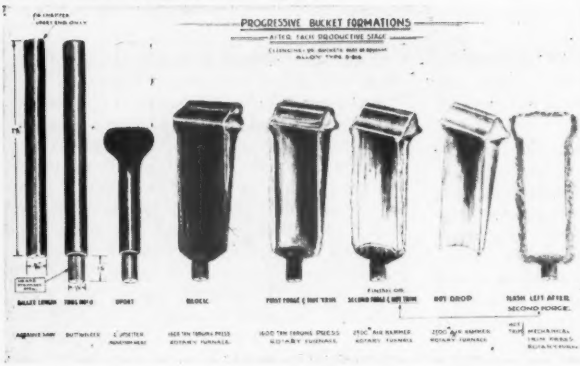
Question: "Let's take one. You have a little demonstrator with you, setup. What does it cost?"

Answer: "That little set is a package unit with 12 retainers, 12 punches, 12 round ones, strippers, the actual die, 12x 12, and it is available for $238. About $95 of that is for the die set. Squares and other shapes can be used on it. They cost additional, in case you specify them. They are available in about two to three weeks now."

Question: "Let us say a company invests in the Whistler setup, and they are

(Continued on page 140)

. . . Precision Forging, from page 65



A typical series of progressive stages in the making of turbine buckets is shown in this layout. The special alloy used in the buckets creates production difficulties not encountered with the blades.

(2) Stamp tong-hold end, chamfer upset end. Billets now are heated in a large Tocco induction heating unit fitted with automatic magazine feed to keep up with the fast cycle of the upsetter. In this case, upsetting is done in a No. 2 Ajax upsetter of standard type, fitted with a four-station die.

(3) Stud-weld tong-hold.

(4) Blocking—The billet is cleaned in an American Wheelabrator. Blocking is done in a 1600-ton Bliss mechanical press, heating for this as well as subsequent operations being done in Holcroft furnaces.

(5) First forge and hot trim—The part goes through the Wheelabrator, then first forge and hot trim in a 1600-ton forging press.

(6) Finish forge and hot trim—The part is Wheelabrated, then finish-forged and hot-trimmed in a 1600-ton press.

Next follow a series of detail operations—restamp root ends, grind flash line, heat-treat and water quench, Tumblast, then the forging is heated and given a hot restrike in one of the 2500-lb Ceco drop hammers.

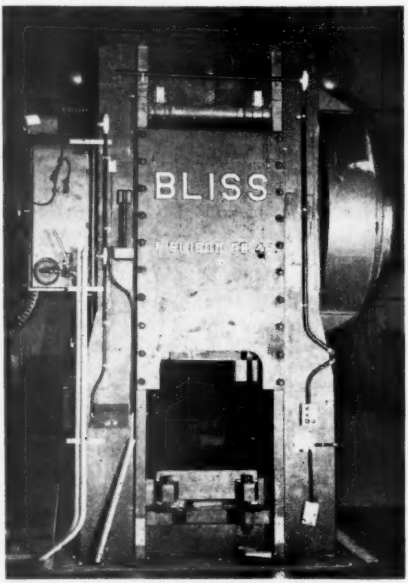
This is followed by an aging heat treatment, pickling, and Magnaflux Zyglo inspection as well as final inspection.

One of the major projects now under way is the installation of a unique kind of die room. The problem posed is that the forging materials are difficult to handle and produce rapid erosion of dies. In fact, it is estimated that die life is limited to around 800 to 1000 pieces. Consequently, die making becomes a matter of mass production rather than tool room procedure.

To cope with this situation, Packard has devised a floor plan quite similar to that of volume parts manufacturing, with a straight line flow of subdivided

(Continued on page 82)

One of the new 1600-ton Bliss presses to be used for finish-forging buckets is shown in the process of installation.



Cincinnati Heavy Duty Universal Spiral Milling Attachment, spindle at an angle to vertical center line. Mounted on CINCINNATI No. 3 Universal High Power Dial Type.

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With these new attachments, you can assign many additional set-ups to your larger CINCINNATI Milling Machines . . . vertical milling . . . angular milling with table or cross feed . . . milling vertical surfaces with table or cross feed . . . milling *helical and spiral gear teeth. The attachments are completely new, and designed for heavy duty work. ¶ Large swivel diameters, accurately graduated, facilitate angular settings of the spindle head. Completely anti-friction drive, rugged mounting arrangements, and No. 50 standard spindle nose complete the heavy duty classification. You may obtain complete specifications by writing for bulletin No. M-1775.

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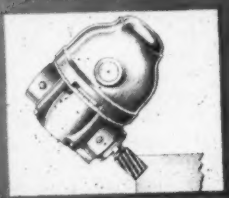
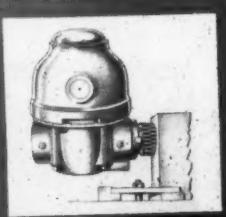


ANGULAR MILLING



Cincinnati Heavy Duty Universal Spiral Milling Attachment, spindle in horizontal position. Mounted on CINCINNATI No. 3 Universal High Power Dial Type.

*In conjunction with Dividing Head Equipment.

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Spindle nose: No. 50 standard
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Heat Treated Rolls Now Engraved By New Tracer-Controlled Roll Engraver

Marking symbols on large rolls used in forming "I" beams, railroad and reinforcing rods used in concrete work has usually been performed in various ways, including stamping and hand chiseling.

To facilitate this operation, a tracer-controlled pantograph engraving machine has been developed. It successfully mills and engraves the surface of large rolls heat treated to 50 Rockwell (C Scale).

Those experienced in metal cutting may wonder at a pantograph machine capable of cutting steel of this surface hardness. However, if the metal isn't too tough, a satisfactory cutter can be designed, speeds and feeds and depth of cut can be established and a successful coolant employed to do the required job. If the work piece is both hard and tough, considerable test cutting must be done before any conclusions can be reached.

However, it is understandable that a ruggedly-built pantograph machine which is capable of precision engraving the necessary symbols in these rolls constitutes a substantial improvement in method and results.

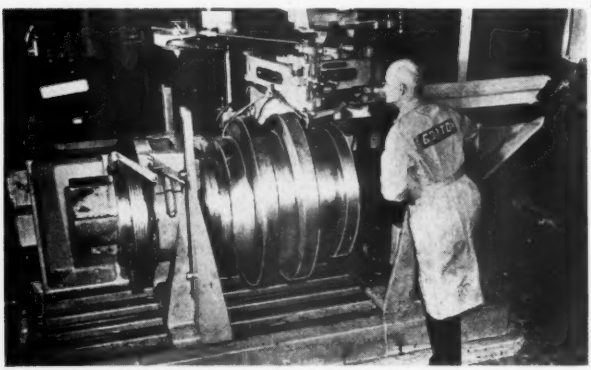
The roll shafts at either end are cradled on two free-running rollers; an indexing ring attached to one end of the roll shaft is operated by a hand crank with worm and worm gear ring to turn the roll to any desired position. If required, a motorized drive or mechanical indexing fixture can be furnished.

This machine consists of a large bed casting, strongly ribbed, which contains an accurate key way running the entire length of the bed in the center. This is used to position the two work holding brackets. On either side of this key way there is a T-slot for use in clamping the two U-shaped work holding brackets, one at each end of the roll shaft. These brackets have 18-inch openings to accommodate roll shafts of varying diameters and each upright has a vertical slot through which clamping bolts are inserted to position and clamp the two cross members which mount the roll shaft supporting rollers. A rugged elevating screw under each cross member is used to position the roll vertically and to provide positive support during use.

A heavily ribbed solid rail with a scraped dovetail way on top is bolted to the rear edge of the base. A 2-dimensional pantograph mechanism is attached to and slides along this dovetail way from one end to the other of the rail. This movement is affected by a large hand wheel and a rack and pinion located under the rear edge of the rail. The pantograph is clamped in any position along the rail by means of a positive clamping lever.

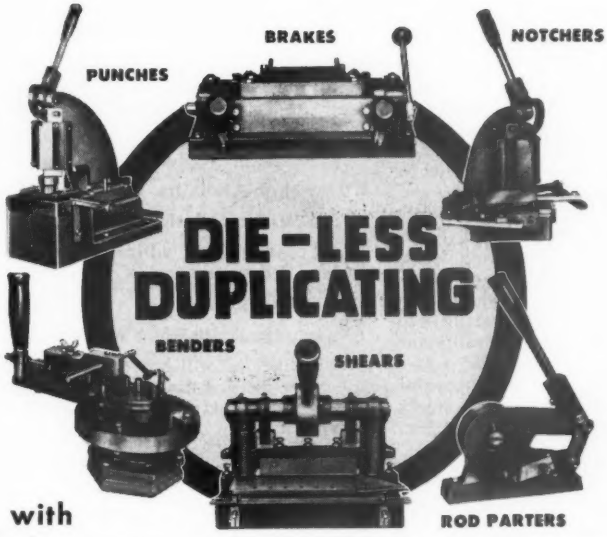
Transverse, or cross movement of the pantograph to bring the cutter point over the axis of the roll is also on scraped

(Continued on page 84)



This tracer-controlled pantograph engraving machine successfully mills and engraves the surface of large forming rolls which have been heat treated to 50 Rockwell (C Scale). The pantograph is a 2-dimensional pantomill with a special saddle between the supporting rail and the pantograph mechanism.

Photos courtesy George Gorton Machine Company



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. . . Precision Forging, from page 78

operations, handled by individual mechanics. One advantage of this new approach is that the preliminary preparation of die sets becomes strictly a machine problem, and requires only machine operators rather than die makers. Incidentally, the time involved in making a die is expected to be greatly reduced.

As the installation of equipment continues into the near future, the setup for bucket production is expected to remain substantially as outlined above.

In the case of blades and vanes, however, the conventional methods of forging may be discarded to make way for a revolutionary technique—a unique horizontal Impacter forging machine—develop by Chambersburg Engineering Co. The Impacter, in contrast to conventional forging presses, has two rams of equal mass and energy coming in from opposite directions and returning to their starting position by means of compressed air. The stock is thus worked to the same degree in each die while stock contact is reduced to be a fraction of a second. Uniform working of forging stock, in this technique, is said to produce better quality and superior physical properties.

Major advantages of the Chambersburg Impacter, as outlined by Packard are:

1. Increased productivity.
2. Improved quality.
3. Lower installation costs.
4. Freedom from vibration due to balancing of dynamic forces.
5. Automatic feed.
6. Increased die life.

This machine will be served by a Tocco induction heating unit of special design, arranged to feed the machine automatically.

$30,000 Mechanical Design Award Program

A new competition for designers, engineers and manufacturers of machinery of all types has been announced by The James F. Lincoln Arc Welding Foundation of Cleveland, Ohio. The new $30,000 Mechanical Design Award Program offers $30,000 in 101 cash awards, as well as national recognition, for the best papers describing the mechanical design and construction of any type of machine or machine component which is designed for arc welded steel fabrication.

Any machine or component whose performance has been improved or whose cost has been reduced through the use of arc welding in its construction can be described. Any person who has participated in the designing, planning or manufacturing of the machinery can compete in the program by describing his work. A total of $20,100 will be given in 54 awards in 18 different Divisions comprised of 18 First Awards of $500, 18 Second Awards of $250 and 18 Third Awards of $150, plus 39 Honorable Mention Awards of $100. Each Division offers a separate competition. A total of $9,900 will be given in Grand Awards to the 8 best-of-the-program papers. All papers are eligible for Both Divisional and Grand Awards. Top award is $2,000, plus $500 First Divisional Award.

Papers may describe machinery in any of the following 18 classifications:

Metal Cutting; Metal Forming; Electrical; Conveying; Pumping and Compressing; Prime Moving.

Jigs, Fixtures and Tooling; Processing; Construction and Mining; Petroleum and Gas; Metal Making and Refining; Textile and Clothing.

Farming and Ranching; Food and Fibre Products; Woodworking, Lumbering and Milling; Household; Printing; Machinery Not Otherwise Classified.

The Foundation states in the Rules Brochure that it is sponsoring the program to stimulate the scientific advance of machine design through the wider use of arc welded construction. According to A. F. Davis, Secretary of the Foundation, "When correct welded design is applied to machinery, performance and appearance are improved, strength and rigidity are increased, service life extended and savings up to 50% can be made".

Papers will be judged by a jury of engineers, educators, designers and fabricators selected from prominent positions in indutsry and education. The program closes July 27, 1953. The Rules and Conditions Brochure is available from the Lincoln Foundation, Cleveland 17, O.

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Advantages of Baumbach Demountable Pins and Bushings in Standard Precision Die Sets
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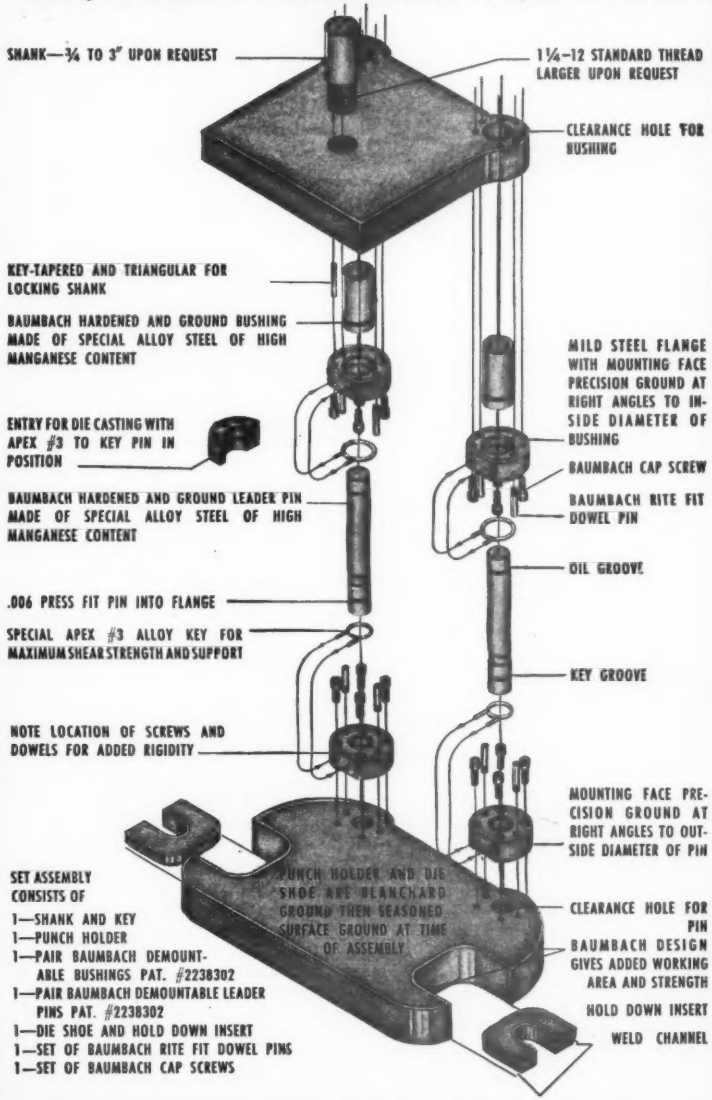
Flexability Reduced Die Costs—Reduced Maintenance Costs—Safety and Hold Down Insert


SHANK—¾ TO 3" UPON REQUEST
1¼–12 STANDARD THREAD LARGER UPON REQUEST
CLEARANCE HOLE FOR BUSHING
KEY-TAPERED AND TRIANGULAR FOR LOCKING SHANK
BAUMBACH HARDENED AND GROUND BUSHING MADE OF SPECIAL ALLOY STEEL OF HIGH MANGANESE CONTENT
MILD STEEL FLANGE WITH MOUNTING FACE PRECISION GROUND AT RIGHT ANGLES TO INSIDE DIAMETER OF BUSHING
ENTRY FOR DIE CASTING WITH APEX #3 TO KEY PIN IN POSITION
BAUMBACH CAP SCREW
BAUMBACH RITE FIT DOWEL PIN
BAUMBACH HARDENED AND GROUND LEADER PIN MADE OF SPECIAL ALLOY STEEL OF HIGH MANGANESE CONTENT
OIL GROOVE
.006 PRESS FIT PIN INTO FLANGE
SPECIAL APEX #3 ALLOY KEY FOR MAXIMUM SHEAR STRENGTH AND SUPPORT
KEY GROOVE
NOTE LOCATION OF SCREWS AND DOWELS FOR ADDED RIGIDITY
MOUNTING FACE PRECISION GROUND AT RIGHT ANGLES TO OUTSIDE DIAMETER OF PIN
PUNCH HOLDER AND DIE SHOE ARE BLANCHARD GROUND THEN SEASONED SURFACE GROUND AT TIME OF ASSEMBLY
CLEARANCE HOLE FOR PIN
BAUMBACH DESIGN GIVES ADDED WORKING AREA AND STRENGTH
HOLD DOWN INSERT
WELD CHANNEL
SET ASSEMBLY CONSISTS OF
1—SHANK AND KEY
1—PUNCH HOLDER
1—PAIR BAUMBACH DEMOUNTABLE BUSHINGS PAT. #2238302
1—PAIR BAUMBACH DEMOUNTABLE LEADER PINS PAT. #2238302
1—DIE SHOE AND HOLD DOWN INSERT
1—SET OF BAUMBACH RITE FIT DOWEL PINS
1—SET OF BAUMBACH CAP SCREWS

WRITE FOR FULL DETAILS OF BAUMBACH'S AUTOMATIC ALIGNMENT WITH PAT'D. DEMOUNTABLE LEADER PINS, BUSHINGS

DIE SET, LAYOUT SHEETS AND CATALOGS FURNISHED UPON REQUEST

. . . **Heat Treated Rolls, from page 80**
dovetail ways. Saddle is then clamped in place by a clamping lever.

When mounting or removing rolls, the pantograph is moved to the extreme right on the rail extension where it is out of the way.

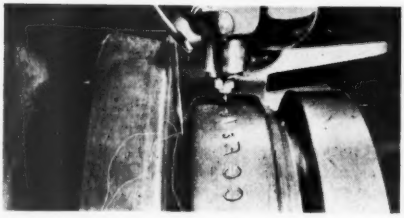
The pantograph on this machine is a 2-dimensional pantomill with a special saddle between the supporting rail and the pantograph mechanism. This pantograph is of extra heavy construction as can be seen by the bulky pantograph arms.

One of the principle advantages of this roll engraver is that lettering, numbering or other designs can be engraved on the curved surface of heat treated rolls by using flat copy or master patterns. These masters can be made simply and economically of steel, sheet iron, brass, wood or plastic depending upon requirements. If an allover (intaglio) design is required, only a segment of the complete design is made into a master. Then the design is cut in the roll by indexing to each new position in order to create a continuous pattern.

Another advantage is provided by the pantograph reduction ratio between tracing stylus and cutter. When an enlarged master is used and the pantograph ratio is set 3 to 1 or 6 to 1, the amount of effort needed to trace the master is reduced by 3 in the first instance, or by 6 in the second as compared with the amount of effort required at a 1 to 1 ratio. When cutting extremely hard metal, as in the case with these rolls, this advantage is important.

Then, too, the horizontal floating motion of the cutter spindle, guided by the tracer is definitely superior for this type of work than would be the fixed spindle type of machine wherein the bulky work piece would have to be moved laterally to permit the cutter to cover the entire area to be engraved.

A forming guide mounted above the cutter spindle and shaped to conform to the curvature of the roll is in direct contact with the former point at the top of the spindle during operation of the machine. As the cutter moves in a lateral plane, actuated by the tracer spindle and pantograph linkages, the forming guide forces the cutter spindle to follow the



curvature of the roll in a vertical plane. A small hand crank is used to bring the forming guide down to its operating position. The forming guide holder slides in V-ways and has two micrometer stop screws for accurate positioning.

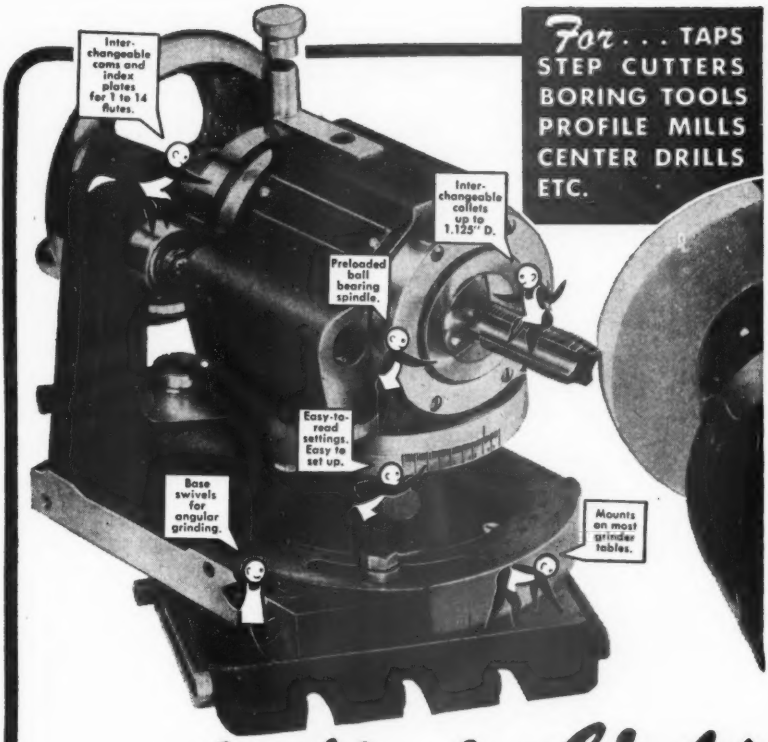
The vertical movement of spindle while the former point at the spindle top is in contact with the forming guide is one inch.

Spindle down feed of an additional inch is by hand crank with micrometer adjustment. Cutter spindle collet size is ⅜ inch. Nine speeds are available by belt adjustment from motor from 1,300 to 9,200 R.P.M. Speeds up to 12,000 R.P.M. are available at extra cost, or, if desired, this machine can be supplied with two interchangeable spindles: (1), the standard belt-driven spindle and (2), a superspeed electric spindle with a top speed of 48,500 R.P.M.

While the machine illustrated here is manually operated, automatic or motorized masters can be employed in certain cases. Likewise, automatic cam-operated spindle down feed can be provided as well as automatic work piece rotation or indexing.

Floor area required for this machine with approximately two feet of clearance all around is 196 inches by 95 inches. Over-all length of machine is 148 inches, width 46½ inches, height 78 inches. Net weight is approximately 10,000 pounds. Roll capacity of this machine is 36 inches in diameter by 7½ feet long. The larger model, not shown here, is identical to this machine except for a longer base and rail for the accommodation of rolls up to 36 inches in diameter by 12 feet long.

Pantograph reduction ratios are 1 to 1, 2 to 1, 3 to 1, 4 to 1, 5 to 1, and 6 to 1 only. Intermediate reductions are easily obtained by using the built-in scale (.020" increments) and formula provided.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. . . Transfer, from page 63

Station No. 4 Pan rail is rough milled with two cutters mounted in a left hand horizontal unit.

Station No. 5. Bearing lock clearance and bearing cap seats are milled, with one horizontal spindle and one vertical cutter arbor in left hand horizontal unit.

Station No. 6. Top of crankcase is semi-finish milled, using one horizontal spindle on a right hand horizontal unit. Pan rail and bearing cap seat are finish milled, using two horizontal spindles in two left hand horizontal units.

Station No. 7. (Fig. 5.) Bearing cap seat lock width is finish-shave broached to size, using broaching block on a left hand horizontal unit.

Station No. 8. Idle.

Station No. 9. Two locating holes are drilled, chamfered, and reamed with four spindles on left hand horizontal indexing head.

Station No. 10. A limit switch checks for excessive stock on the oil filter side of the crankcase, thus eliminating interference on following operations. Excessive stock is announced by a red light on the control panel. The crankcase is then indexed into range of an electric eye, and the machine will not index until the crankcase is removed from the transfer mechanism and from the machine. This prevents jamming of the machine and possible injury to the operator.

Figure 5 shows the crankcase at Station No. 7, in position for broaching for main bearing cap seats. The crankcase rests on (4) milled pads (F), two at each end of crankcase on the right or freeze-plug side, and is positioned by a hydraulic indexing bar with fingers (B) at each end of the part. These position the crankcase in contact with a locator (D) at rear of part. The locator secures thrust of part while broaching.

Two retractable fingers at underside of part (H) at each end (J) pull the crankcase (head mounting face) in contact with a locating rail (E). Another central hydraulic clamp (G) holds the part securely in position. At top of part (or tappet cover side) and at each end, are two radial type hydraulic clamps (C) with angular pressure contacting the part at oil galley boss and one hold-down clamp (A) over the entire tappet side cover opening.

This type of positioning and clamping has proven successful with heavy parts and prevents them from shifting under such operations as the broaching done at Station No. 7. Shifting of the workpiece would of course be disastrous to the cutting teeth on the broach block (I).

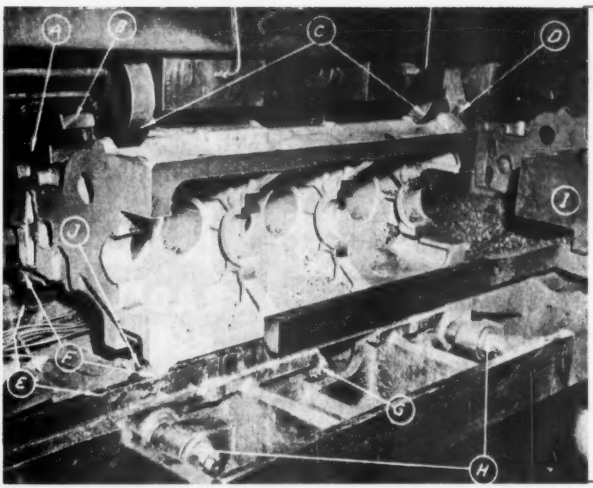

Fig. 5. Cylinder block at broaching station, No. 7, of Ingersoll transfer machine.

Key to Principal Parts

(A) Hold-down clamp over valve lifter-rod cover face
(B) Transfer bar with fingers
(C) Radial type clamps
(D) Thrust locator
(E) Locating and transfer rails
(F) Milled pads on block, for locating
(G) Central holding clamp
(H) Retractable positioning clamps
(I) Broach blocks
(J) Locator (at each end of crankcase)

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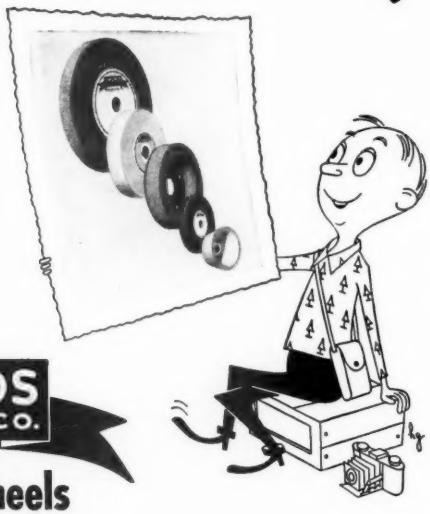

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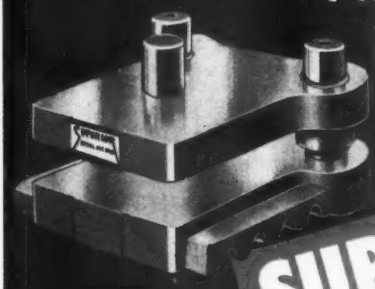

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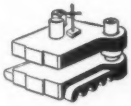

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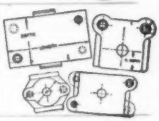

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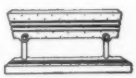

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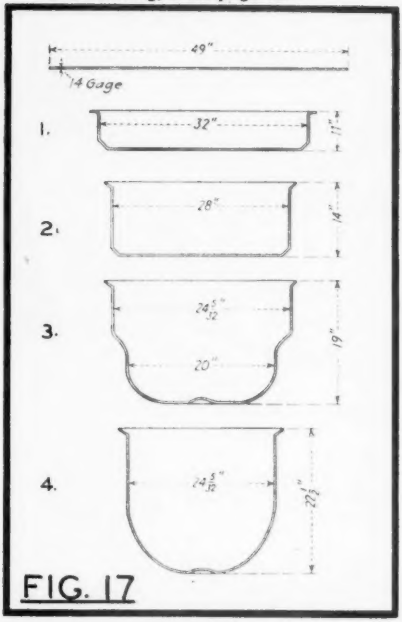
. . . Cold Forming, from page 75



Drawing courtesy Amco Steel Corp.

Fig. 17. Successive steps in drawing a 24" mixer bowl from a 49" blank of 14 gage stainless, type 302.

Both the ferritic alloy, type 430, and the martensitic alloy 410, can be successfully formed on shallow and medium draws; the former mentioned alloy can be formed into complex shapes, however a greater number of interstage anneals are required. Initial reduction in precentage figures for the straight chromium stainless composition is approximately 25 to 30 percent.

It is again stressed that it is imperative to have a planned program of reductions and inter-spaced anneals, so that a maximum amount of work per reduction can be realized. This, of course, is for the sake of economical production and in many instances it is best to plan a sequence of operations where one less anneal than that actually found true be tried. Thus, on a four draw sequence which had been determined by experimentation, one would try to perform the operation in a three draw sequence and if this fails, the four draw sequence can be tried and adopted. However, if a decision is made that the job can be performed in a five draw sequence, it will be successful from the start and usually it will not be determined whether the job can be done in a four draw sequence since it is human nature to 'let well enough alone' where a difficult draw job is encountered.

Illustrated in Figure 15 is a draw sequence of a tubular part made from type 347 stainless; the equipment used on all draw sequence being a double action hydraulic press with 250 tons available on the punch and 100 tons available on the hold-down. The die, punch and blankholder was made of alloy cast iron which was polished and re-polished every 100 to 300 parts. A regenerative anneal was performed after each draw sequence; this being performed in a gas fired furnace. Successive reductions have been made extending over seven draw sequences; the first drawpiece often being referred to as a 'cup' while each succeeding draws are usually termed 're-draws.' In order to complete the part, auxiliary operations follow consisting of trimming both ends with a nibbler, expand both the top and bottom ends, turn the upper end to required outside diameter, trim to length and bevel on a lathe. Any defects found on the surface is removed through light grinding after which the part is subjected to an anneal and subsequent pickle.

In frequent instances, where a reduction of 50 percent from blank to cup can be realized, this reduction is taken in a cup and succeeding re-draws; it being very infrequent that the full reduction is taken in a single operation such as a cup. The number of operations required to obtain the maximum reduction before the first inter-stage anneal will depend upon the punch radius; a sharp bottom radii limiting reduction to guard against corner breakage, whereas a large corner radii limiting the cup reduction to prevent wrinkling. This type of reduction where a maximum reduction of approximately 45 to 55 percent is taken in successive draws before the first interstage anneal is illustrated in Figure 16. This is a stepped part with various cylindrical sections approaching the concourse of a cone, after a number of re-drawing operations. In each draw, the diameter of the part is

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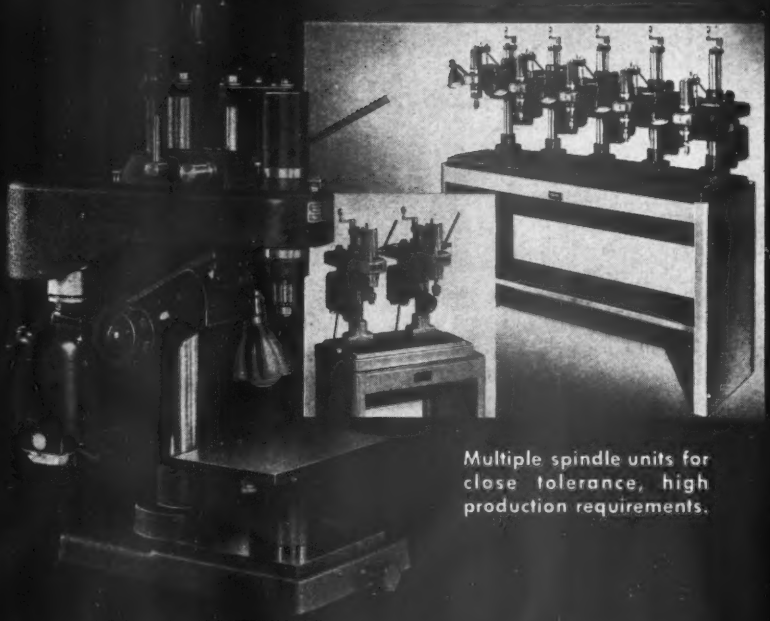

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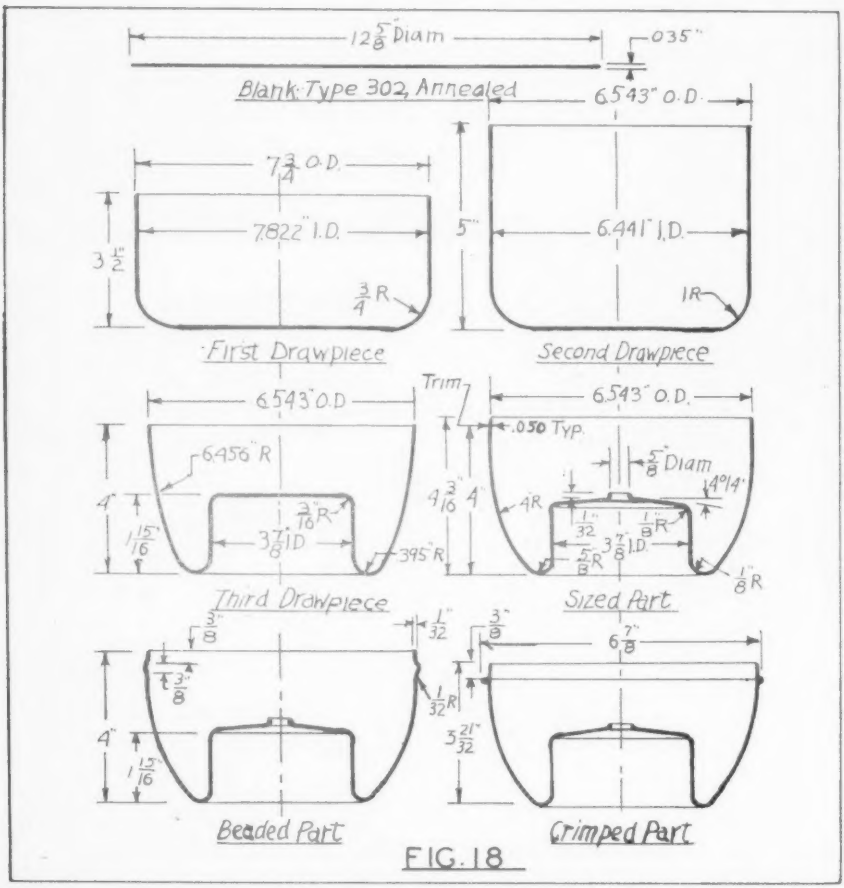
subjected to a reduction between 15 and 20 percent; occasionally the reduction slightly exceeds the larger value given. The material used is annealed type 302 stainless; the first draw or cupping operation being performed on a single action press equipped with a die cushion, the press having a rated capacity of 95 tons. The die and hold down was made from aluminum bronze and the punch was made from a tool steel composition. An emulsifiable pigmented water soluble compound was used as the drawing lubricant; this being diluted two to one with water. Both the second and third drawpiece was made on a single action press, however two tools assembled in a gang die was employed. Both the die, punch and hold-down was made from an alloy steel with the same lubricant as mentioned employed. The annealing operation came after the third, fifth and seventh draw;



Drawing courtesy International Nickel Co., Inc.

Fig. 18. Illustrated is an excellent example of a fairly deep reversed contour draw. The cup is being made by International Harvester on a double action press. (Ref.[1]).

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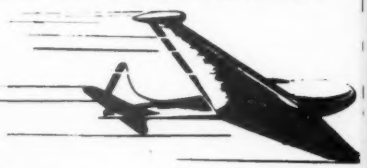

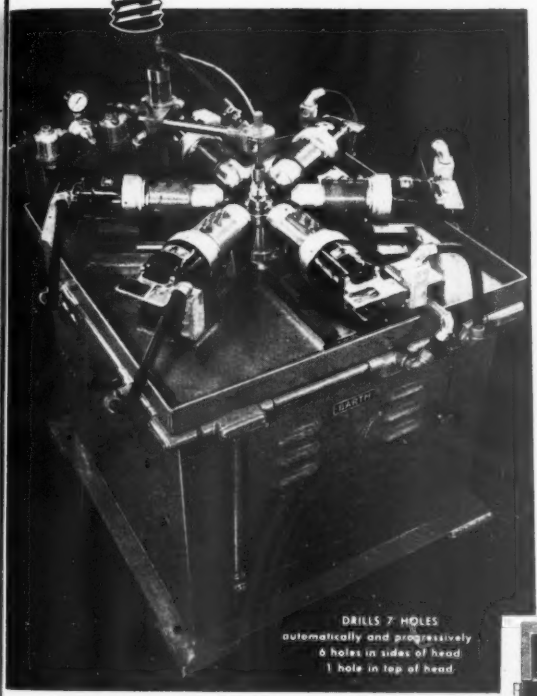

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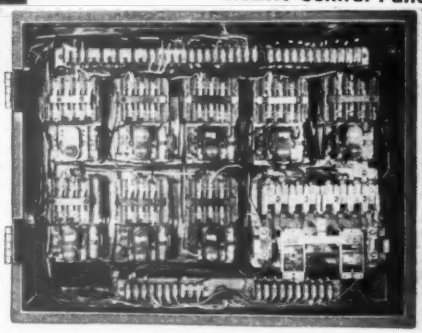

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both the fourth and fifth, and the sixth and seventh drawpiece being made with similar equipment and tools as that employed for the second and third drawing operations. The auxiliary operations that follow the final drawpiece include presizing, piercing and trimming.

A reverse re-drawing procedure serves primarily to form parts with a recessed bottom contour; in the event that the reverse contour is rather shallow, it is often incorporated in the drawing tools as is illustrated in Figure 17. This is a four draw sequence; the first drawing or cupping operation consisting of approximately a 20 percent reduction from a 49 inch blank. This is followed by a re-draw in which a reduction of approximately 15 percent reduction is realized; the diameter of the cup being 28 inches. At this stage, the first regenerative anneal is inserted to restore the ductility of the material and permit further working. In the third drawpiece, a two step punch is employed giving a two diameter shell; the reductions being approximately 15 percent on the top portion of the shell and about 28 percent reduction on the bottom half of the shell. The shallow reverse contour on the bottom is incorporated in this redraw operation using a mating die with a contour bottom pad. The second regenerative anneal follows after which the final draw is made to complete a shell with the dimensions indicated. The bowl is accurately sized in subsequent spinning and a bead is formed along the top edge.

Reverse drawing is used to form tubular, ring shaped and deep reverse contour cups; the designs being limited only by the stretching ability of the material formed. Deeply recessed parts are difficult to produce, especially where the austenitic stainless steels with their characteristics work hardening properties are to be formed, however, success can be realized by judicial choice of operations where both reductions and radii are given considerable thought. An excellent example of a fairly deep reversed contour is illustrated in Figure 18; this cup being made by International Harvester [1]. All of the drawing operations illustrated have been performed on a double action press; the die and hold-down being made from aluminum bronze, whereas the punch had been

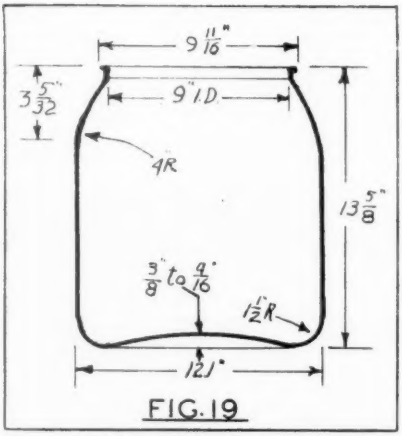

Fig. 19. Bulging is frequently performed on shells that have been previously drawn. The milk pail illustrated has been drawn from a blank 27⅝" in diameter to a shell 17⅛" high by 9.144" in diameter in four draws. The shape shown is the result of a bulging operation. (Ref.[5]).

made from cast iron with a steel nose that had been case hardened. The lubricant employed in drawing was a emulsified pigmented compound diluted 1 to 2 with water. An exceptional reduction is realized; the first drawpiece or cup and the second drawpiece or first re-draw being performed in sequence before a regenerative anneal is placed on the shell. After pickling, the third drawpiece is obtained; this having the recessed contour. The hole is pierced, the part sized and the hole flanged; all operations being performed in a single action press utilizing a gang die equipped with three stations. The shell is then trimmed on a lathe and then deburred after which a form bead is made with contouring rollers. The finish form follows; a single action press having a capacity of 140 tons is used.

Drawing rectangular and other noncircular cross sections is usually more difficult, this difficulty increasing as the shape deviates from a cup and as the depth of the shell increases. Shallow cup or boxed shaped parts can be drawn in one operation from a squared sheared rectangular blank, however where deeper draws are encountered, a developed blank of various contours is realized. In the

(Continued on page 98)

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Another benefit in the picture is the fact that preliminary design of aircraft has been restricted somewhat due to the lack of sufficiently economical production methods for tapering skins. The new method also may be an answer to the fear of many expert wing specialists who state freely that present methods could not hope to cope with actual anticipated wartime requirements.

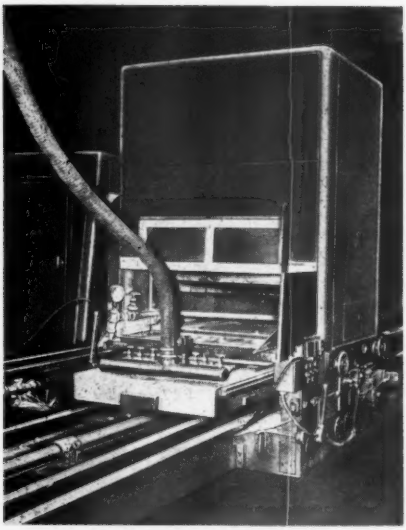

Photo courtesy The Carborundum Company

Modified wide-belt abrasive machine used in the new method of producing aircraft skins. Tests to date indicate much faster reduction rates at considerably lower costs. (Abrasive belt has been removed to show rubber-faced contact roll.)

The process involves the use of a wide belt grinding machine to which certain modifications have been made. Using a wide abrasive belt in conjunction with a "61" rubber-faced contact roll, cuts up to one-tenth inch in depth can be taken over the entire width of aluminum sheets up to 72 inches wide. Moreover, the equally important subsequent operation of polishing the aluminum sections can be handled on the same machine through a simple change of the abrasive belt to a finer grit belt, thus further reducing over-all production time.

The new process, tested thoroughly with the help of Bell Aircraft Corporation production men, showed that varying tapers can be generated easily with this abrasive belt method and that finished skins can be produced at a considerably faster rate than heretofore. The secret of the faster stock removal rate lies in the millions of cutting edges in the form of abrasive grains being presented to the entire width and surface of the sheet, whereas mill fly cutters, for instance, can operate on only a twelve to fourteen-inch (maximum 24" to 28" using two heads) section of the sheet at one time.

Quick, accurate and steady holding of the sheet is assured through the use of a vacuum chuck. Operator training is no great problem, one good machinist and helper can do all that is required after a few days of training. Since the relatively inexpensive abrasive belts are discarded when worn out, no cutting tool maintenance is required, thus any necessity for cutting tool balancing and sharpening is eliminated. There is no time-consuming operation required for setting the belt in position to cut.

As in other machining methods, the material removed by the abrasive method is salvagable and has exactly the same scrap value. The capital investment required for the abrasive belt machines is relatively low in comparison to that for machines utilizing existing methods.

(Continued on page 194)

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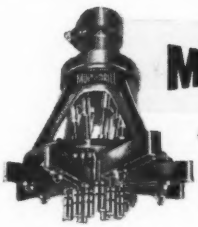

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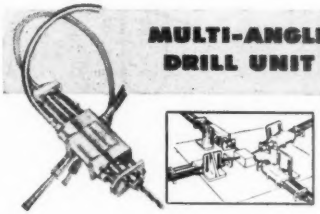

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. . . Cold Forming, from page 94

drawing of an oval container, the compressive movement is greater in the ends than on the sides of the container; this condition being of greater magnitude as the shape approaches that of a rectangle. The greatest difficulty that is encountered is the crowding of the metal at the corners of the shell where high internal stresses will build up as compared to the relative freedom of metal movement on the sidewalls of the drawn shell. This may result in wrinkling, the degree depending upon the size and shape of the drawn container and the design of the specific blank from which the material is drawn. On any specific shape that is contemplated, experimental work is in order so as to determine the variables and the effect of these variables on the drawn form of the particular draw; the determination of these factors being helpful in drawing a part successfully in production. In many instances, considerable time may elapse before a correct sequence is determined and it is recommended that the experience of others be sought so as to avoid unnecessary development time.

Greater radii of tools is usually required; this value usually being five times the metal thickness. In corners, this radii may exceed the value given so as to provide additional relief in these areas. In re-drawing operations, it is usually necessary to work from larger to smaller radii; this ratio being determined so as to be consistent with the blank hold down corner strength so as to avoid the possibility of wrinkling. Clearance values of approximately 10 precent the metal thickness is satisfactory. Also, due to the increase of metal thicknesses at the corners of a rectangular shell, it has been recommended (1) that the die radius be equal or smaller than the punch radius at these edges in order to provide additional clearances. In some instances, it may be helpful to place tabs on the corners where the blank holding surfaces can grip or hold back surplus metal, or to make corrugations which may aid in gripping the tabs.

Bulging is frequently performed on shells that have been previously drawn; this operation involving compressive stresses. This type of operation can be performed either mechanically or hydrau-

(Continued on page 102)

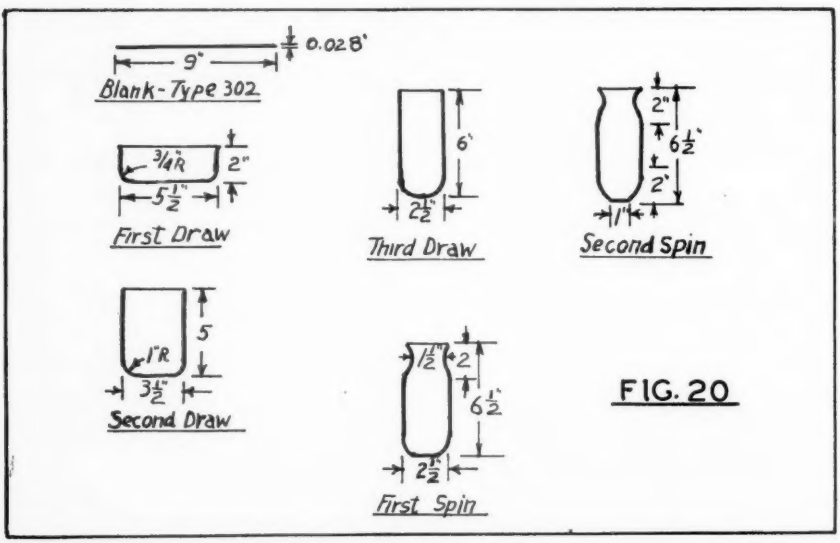

FIG. 20

Fig. 20. A typical sequence of drawing and spinning procedure is shown. By "trial and error" it can be determined whether the workpiece should be produced by spinning or a combination of drawing and spinning.

riveting..broaching..bending..assembly

150 TONS CONTROLLED POWER

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The Lempco ELECT-DRAULIC 150 Ton PRESS is fast and powerful, with capacity for a variety of shop work including try out and production pressing.

A special patented finger tip control runs the ram down to the work in a hurry and builds rapidly to pre-selected tonnage. The ram holds at pre-determined tonnage, eliminating the danger of spoilage or mashing rivets. Hydraulic operation in both directions gives powerful ram retraction, making it possible to use the Elect-Draulic Press for "stripping" or operating pull broaches. The ram speed is 12" to 13" per minute, with a ram total of 12".

Roller mounted ram and cylinder unit can be moved across the entire width of the press. A conveniently located switch enables one operator to center work and control the press as well. A twelve-inch space between both bolster and side columns permits work to be fed from the side or front of the press.

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LEMPCO *for 35 years... a leading builder of machine tools*

. . . **Magnetic Piercing, from page 73**
area and greater freedom for loading, unloading, and progressing work from one set to the next, but will also permit taking still larger panels. Furthermore, we still have the large horn area on the brake to utilize for larger work if necessary.

On any new or revised panel that appears to have a substantial life span, a preliminary analysis of the part is made to determine the number of setups, the need for and the cost of any additional tooling, and the practicality of using this method. If acceptable, our drafting department takes over and proceeds to lay out each operation, as disclosed in Figure 4.

Meanwhile, any special tooling required is ordered from the supplier. The route and work rate sheets are also revised to conform with the improved system.

Layout of the press setup is relatively simple. Plastic templates furnished by the equipment manufacturer enable the draftsman to quickly locate and draw the openings to be jig-bored on the sheet metal templates. He also draws in the outline of the retainer, thereby eliminating the possibility of specifying two holes on one setup that cannot be produced due to interference of retainers or insufficient slug clearance.

In general, standard retainers for holes up to ½" diameter require a 2" minimum center distance; those for holes over ½" up to ¾" diameter require a 2¼" minimum center distance; etc. There are other controlling factors, such as the necessity for added slug clearance on a group of closely spaced holes where retainers are to be mounted end-to-end.

A coordinate dimensioning system, Figure 4, is used for guidance of the jig-bore operator. All holes are dimensioned vertically and horizontally from imaginary center lines drawn through a single locating or zero point. This is the centerpoint of one of four corner holes in the template.

Rough template blanks are procured with these four corner openings to match the locating posts on our particular die sets. The necessary specifications are kept on file by the manufacturer.

The next problem is to ensure accuracy of hole location with respect to the panel's outer dimensions. This requires positive, accurate location of the piece part itself.

Where the panel to be produced is one of a standard series with uniform outside dimensions, mounting holes along the edges can then be punched in numerous panel numbers on a single press setup. Two of these mounting holes are then used for locating the part over pilot pins on all additional setups.

Where the panel does not have prepunched holes which can be used for locating purposes, a combination of solid and spring-pusher type stops or gages is

(Continued on page 114)

Fig. 3. Most panels can be most efficiently handled on two setups mounted on the press brake. Work is progressed from right to left, each hit delivering a panel finished at both stations.

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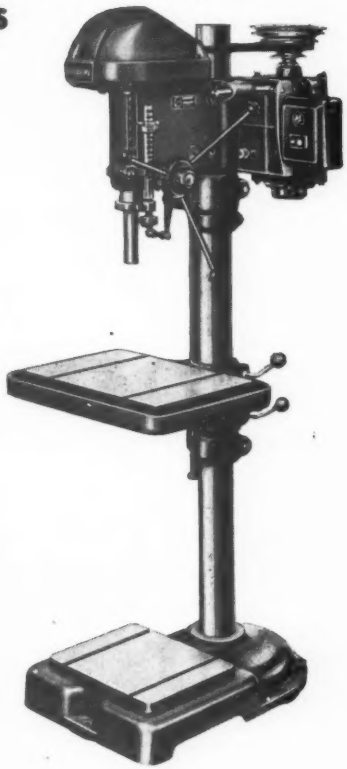
Get these important new drilling advantages with a Clausing 18" Drill Press. The 6½" spindle travel gives bigger job capacity, permits better use of production chucks. Drilling capacity: ¾" in steel, 1" in cast iron. There's 6" to 13" *more* capacity from spindle to table. Spindle is bigger, stronger — handles larger tools. Exclusive vernier control provides .001" depth accuracy. Positioning mechanism saves set-up time — moves *both* head and table. Massive construction, precision-machining throughout, and the smoothness of 5 ball bearing races insure exacting accuracy on every operation. Contact your Clausing distributor, or write for catalog.



Precision Ground 13" x 18" Oil Table, 12" x 14" Base

CLAUSING DIVISION

ATLAS PRESS CO., 9115 NORTH PITCHER STREET, KALAMAZOO, MICH.

. . . Cold Forming, from page 98

lically; the former method employing either a segmented metal die or a rubber punch. The use of the segmented die; the segments being activated by means of springs at both the top and bottom ends, is limited where the finished part is required to have a high polish since objectionable flats may occur upon expanding. Rubber punches, although they eliminated these objectionable flats, are best suited for limited production since ordinarily a maximum of 3000 to 4000 pieces can be bulged before the punch must be replaced. Hydraulic bulging of a milk container (Figure 19), is well suited for intricate shapes, however difficulty may be experienced unless the correct volume and pressures required are pre-calculated. In addition, proper venting should be provided to allow for the escape of air during bulging, and the system be such that no leakage and subsequent loss in power is experienced. The milker pail as illustrated in Figure 19, had been drawn from a blank that was 27⅝ inches in diameter; a four draw sequence resulting in a shell 17⅛ inches high and 9.144 inches in diameter. This straight sided shell, the product of the fourth draw, is trimmed and flanged after which it is hydraulically bulged. A pressure of 2500 psi against the side walls is sufficient to expand the walls to the form indicated. A production rate of approximately 90 per hour is realized.

Spinning is also closely associated with deep drawing since it often follows in sequence a series of drawing operations. Here again, the power required to form stainless is high due to the high tensile strength of the material worked; the speed of spinning being about one-third that used in the spinning of the carbon steels. This operation requires highly skilled operators since it is his judgment which determines such factors as the speed, pressure required and the amount of working permissible before the item must have a regenerative anneal. The determination of a sequence operation involving either direct spinning from a blank, or a combination of drawing and spinning can be determined by 'trial and error' procedures; this practice also determines the interspacing of the required anneals.

In spinning, the edge of the material spun is left untouched until the work is fairly well completed; this practice preventing any possibility of cracking or splitting due to an excessively cold worked edge. Thus, in the spinning of the austenitic alloys, the article may be spun with a flange, and after spinning has been completed, operations such as trimming and possibly beading follow. Stress cracking will be experienced in these types of alloys if inter-stage annealing is not provided between spins; the location of these anneals being pre-determined through experimentation prior to actual production work on the part. It is also good practice to hold to a minimum the amount of work performed in a final spinning; a stiffness sufficient to obtain the necessary rigidity of the part is required, however not enough to risk stress cracking after the part is completed. Where danger from the latter condition may be present, a stress relief may be provided which may consist of heating the part to a temperature not over 750° Fahr.; the choice of temperature being dependent upon the amount of stiffness in the required part. If a full anneal is desired, heating to 1850° Fahr. followed by a suitable air or water quench, preferably the former, is practiced, however this will result in maximum softness.

A typical sequence of drawing and spinning procedure is illustrated in Figure 20. The first reduction from the blank is approximately 40 percent; the second reduction about 30 percent; and, the final reduction about 22 percent. An anneal was inserted after each drawing operation. In spinning, the first spin consisted of necking and flanging the top, care being taken to complete most of the reduction in the neck before producing the entire sweep up to the mouth of the item. The second spin merely rounded the bottom of the shell.

Group IV

In the fourth classification in cold forming where a squeezing action takes place to obtain the desired deformation, cold heading is one of the more frequent utilized operations. Regardless of the type of stainless employed, a uniform grain structure along with maximum values in toughness and impact strength is required since severe deformation results. In order to avoid such surface irregularities such

(Continued on page 150)

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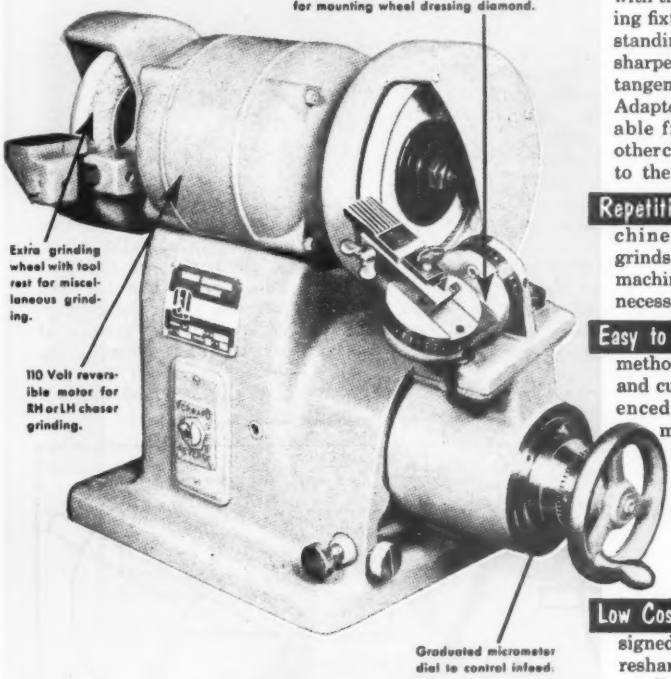
UNIVERSAL BENCH TYPE
CHASER SHARPENING MACHINE

Specifically designed to resharpen chasers, this *Low Cost*, space savin machine allows you to free heavy expensive machine tools for the intended uses, and at the same time do a better job of chaser sharpening. *It's good for miscellaneous small tool and cutter grinding to*


J & L Universal Grinding Fixture with tangent chaser. Basic fixture has provision for mounting wheel dressing diamond.
Extra grinding wheel with tool rest for miscellaneous grinding.
110 Volt reversible motor for RH or LH chaser grinding.
Graduated micrometer dial to control infeed.

Grinder set up to resharpen J & L Tangent chasers

Universal Application Equipped with the new J & L chaser grinding fixture and adapters, an outstanding job will be done on all sharpening operations, for both tangent and radial die chasers. Adapters for J & L chasers available from stock. Adapters for other chasers can easily be applied to the chaser grinding fixture.

Repetitive Accuracy This machine will duplicate desired grinds repeatedly. It is a precision machine tool equipped with all necessary stops and controls.

Easy to Operate Simple, direct methods speed up the operation and cut costs. Even an inexperienced operator can, in a few minutes, learn to resharpen chasers on this machine.

Saves Space BENCH SPACE 14 x 28 inches is ample for your complete chaser resharpening operation.

Low Cost This complete unit, designed to do your entire chaser resharpening job, sells for only a small fraction of the cost of other bulkier machines often used. Why not install one in your plant and release your heavier, bulkier machines for their intended uses?

Because of its size this machine can well be a time saver in shops where cutter grinding rooms are at distant points from the machines where dies are used. Write Dept. 710G for further details.

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DIE HEAD DIVISION

Stepless Speed Control

One solution to the problem of transmitting constant power through a steplessly variable gear at all speeds has been attained by a new variable speed gear designed by a Swiss engineer, Jean E. Kopp.

This variable speed unit has a claimed mechanical efficiency of 90% at all speeds. The speeds may be changed easily and infinitely within the ratio range. The output speeds are variable from ⅓ to three times the input speed. Power is transmitted through friction elements and a compensating arrangement prevents them from slipping. In fact, as the load increases, pressure between the friction elements increases in proportion, and excess load will stall the motor before slipping the transmission.

The underlying principle of this new unit is best explained by reference to the accompanying diagram. The drive and driven members of the unit are two conical discs between which are several balls which transmit power from one disc to the other.

The balls are mounted to run freely on short spindles which can be tilted. When the ball spindle is parallel to the disc axes as shown at A, the gear ratio is 1:1, since the contact diameters of the ball with the disc are equal. When the ball axis is tilted, as shown at B, the contact diameters are different. The peripheral speed of the ball where it contacts the driving disc is obviously greater than the peripheral speed of that part of the ball

(Continued on page 193)

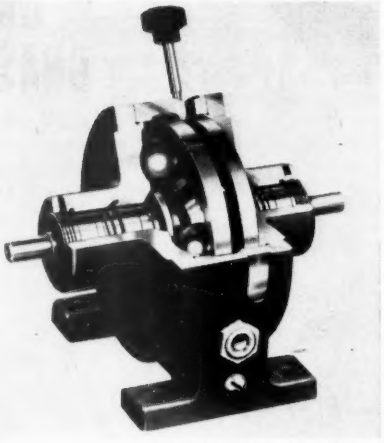
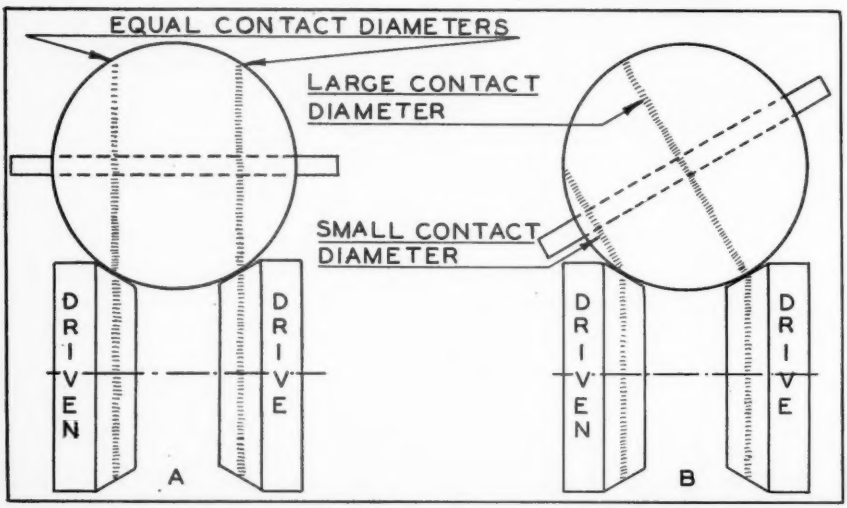


Photo courtesy Allspeeds, Ltd.



A PRECISION Surface Grinder with the type of accuracy that has always been associated with larger and more costly machines.

It is speedy and proper location of controls makes it unusually convenient to operate.

Users of the Boyar-Schultz No. 6-12 Surface Grinder tell us they obtain flatness, vertical and parallel tolerances that compare with the best work of any other surface grinder, regardless of size.

It is the kind of machine that is turned to instinctively for intricate gage work.

BOYAR-SCHULTZ NO. 6-18 TOOL ROOM SURFACE GRINDER

Write for Circular.

BOYAR-SCHULTZ CORPORATION
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SEE ADVERTISERS INDEX, BACK OF BOOK, FOR KEY NUMBERS

A Program for Industrial Diamond Salvage

The Salvage Division of the National Production Authority is conducting a nation-wide program for the conservation and reclamation of industrial diamonds.

The ever-expanding requirements for industrial diamonds, especially crushing bort for grinding wheels, poses an increasing threat to the economy and defense of our country. With present needs in excess of supply, everyone who handles industrial diamonds in any form must exercise intensive thrift in order to provide the volume and quality of carbide-tipped cutting tools vital to metalworking.

To institute an industrial diamond salvage campaign at your plant:

1. Salvage unused diamonds by making an immediate inspection and inventory of any accumulation of worn out, broken, and obsolete diamond grinding wheels and tools. Your supplier will reimburse you for reclaimed diamonds returned to him.

2. Appoint someone with authority to form an in-plant salvage committee, and put into effect and enforce a program to improve salvage practices within the plant, bringing the importance of the program to the attention of all personnel who handle industrial diamonds in any form.

3. Welcome the representatives of your supplier, for they will instruct personnel in the best methods of salvaging diamonds in your plant.

4. Make a frequent check of wheel and tool handling and of swarf and sludge collection in order to keep in line with proper procedures; and make a survey every 30 days of potential salvable material, including obsolete diamond-bearing wheels and tools; collect all forms of diamond waste for proper disposition.

Handle tools carefully to get longest service from them. To prolong the life of industrial diamond wheels and tools:

1. Strictly control the initial use of diamond wheels, including rigid tool crib control and proper wheel application to the job, to insure maximum grinding efficiency per carat of diamond.

2. Strictly control the use of diamond-tipped tools.

3. Train personnel to properly operate grinding wheels and cemented-carbide tools in accordance with advice and instruction of the supplier.

4. Use other abrasives whenever the application permits.

5. Mount diamonds in the tool shank to take advantage of the crystalline orientation of the stone.

Although grinding wheels require 50 percent of the crushing bort supply, as much as 50 percent of the bort can be saved by the following practice recommendations:

1. Back off the steel portions of carbide-tipped tools on aluminum oxide grinding wheels, to avoid grinding of steel by the diamond wheel.

2. Prepare and rough grind the cemented-carbide tools on silicon-carbide wheels.

3. Check spindles to keep them true and operating within close limits.

4. Mount diamond wheels with extreme care, to assure that back plates, flanges, and spindles are clean, free from burrs or nicks, and running true.

5. Follow wheel manufacturers' speed recommendations.

6. Use diamond grinding wheels only when they are in excellent operating condition; cleaned and dressed.

7. Use metal- or vitrified-boned diamond wheels instead of resinoid for off-hand grinding.

8. Grind wet whenever possible, for this permits a diamond bort saving of approximately 30 percent over dry grinding.

9. Use a generous flow of coolant whenever practicable; otherwise use a mist coolant.

10. Grind cemented carbides on separate machines to keep diamond wheel sludge separate from other sludges.

Although truing restores the cutting face of the wheel to running truth and dressing improves or alters the cutting

(Continued on page 138)

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"MT 6"—The Standard "M2 Type", High Speed Steel. Designed for a superior tool and at the same time save critical alloys.

We don't sell "adequate" tool steel. Various qualities and grades certainly, but every quality and grade outstanding in its price class, formulated to do a better than average job. The experience of many companies in making substantial savings through the recommendation of Darwin sales engineers is impressive. Ask now how we can help you — call or write today!

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SEE ADVERTISERS INDEX, BACK OF BOOK, FOR KEY NUMBERS

Economics of Rotary Gang Slitters

The sheet metal slitting machine of today is capable of slitting or shearing into multiple strands, sheet stock or coiled stock on the same slitter in this manner:

(1) When slitting sheets the slitter will have placed on its entry side a sheet feeding table usually of the gravity roller type from which the sheets are manually fed into the slitter, and on the exit side a similar table for receiving the multiple strands.

(2) When the operation is for the slitting of coiled stock, the slitter has placed at its entry end a coil unwinding or pay-off reel, and on the exit side a rewinder or recoiler which rewinds the multiple strands into as many new coils.

by **J. F. Major**
Design Engineer
THE YODER COMPANY
Cleveland, Ohio

The two above operations are limited to sheets or coils of steel but work equally as well on the non-ferrous metals, and in the past few years sheets of certain plastic materials have been successfully slit.

Power Shears versus Rotary Slitters

Since coils cannot be handled in a shear, the comparison lies mainly between it (the shear) and the sheet slitter. It must be stated immediately, however, that the one will never obsolete the other.

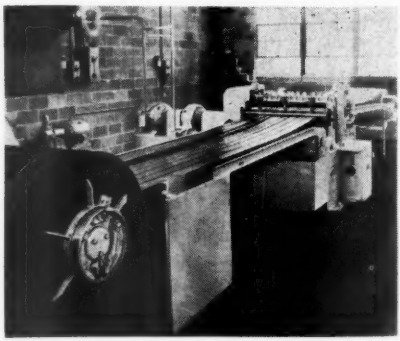
The power shear has an advantage in that it can be used for cutting metal in any direction; longitudinally, crosswise, and at any angle. It may also be fitted with special knives for cutting through such shapes as angles, tees, and channels, while the rotary slitter can cut only in one direction; longitudinally, and parallel with the edges of the sheet or strip.

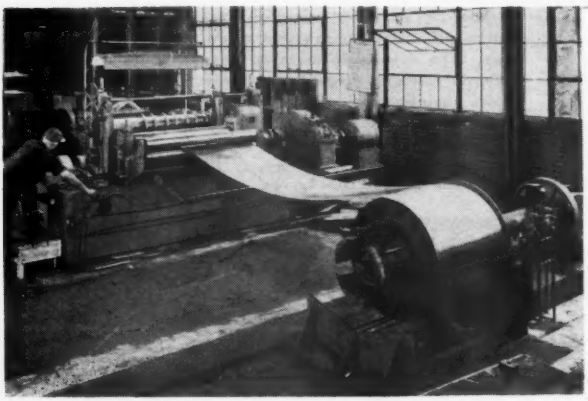
The shear can only make one stroke or cut at a time while the rotary slitter can produce as many as 20 multiple strands from one sheet.

Economy Through Speed and Accuracy

A sheet slitter usually operates at 75 to 150 F.P.M. depending largely upon the thickness and length of the sheets.

(Continued on page 112)





(above) The slitter in the "line" pictured above will handle a maximum stock width of 36". At the far end (entry end) can be seen the pay-off reel. For this particular job, the gang of rotary cutters is cutting the stock into 14 strips. These multiple strands are taken up by the rewinder at the left or exit end of the line.

(left) This complete line comprises coil-car, uncoiler, slitter, scrap chopper and recoiler.

Photos courtesy
The Yoder Company

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Order from DIE-CO for prompt service! Complete variety—Socket Type Shoulder Screws, Socket Head Cap Screws, T-Slot Bolts, Nuts & Washers, Hollow Set Screws, Socket Flat Head Cap Screws, Socket Button Head Screws, Hollow Pipe Plugs, Allenuts, Square Head Set Screws, Flexloc Nuts, Lockwashers, Hex Wrenches & Key Sets, etc. All top quality, in widest range of sizes and types to fit every need.

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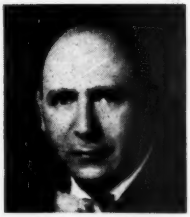
MEN YOU SHOULD KNOW . . . . . .

ARCH MORTON

PAUL W. TAYLOR

ROGER MAGOUN



MILTON D. THALBERG

★

Arch Morton, head of Morton Machine Works, 2421 Wolcott St., Ferndale 20, Mich., has returned to supervise company activities after a year's absence. He has appointed Paul W. Taylor as Morton's new manager. Mr. Taylor comes from The Cadillac Tank Plant in Cleveland, where he was in charge of the Special Assignment Division. He has had a diversified training in parts manufacturing ranging from processing to sales management.

★

Roger Magoun became Norton Company's economist on August 1st. He succeeds Stéphen P. Foster who retired July 31st after 32 years with the company. Mr. Magoun came to Norton's Abrasive Division in 1928, and transferred to the Grinding Machine Division in 1929, where he spent the next 20 years. He was appointed assistant economist in 1949.

★

Milton D. Thalberg was elected president of the newly formed American Association of Machinery Importers at its first meeting. Each member of the association has subscribed to a rigid code of ethics which will guarantee that the machines handled by members will be of top quality and meet the highest trade standards.

★

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and Electro-Pneumatic
Controls give
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. . . . . MEN YOU SHOULD KNOW

WALLACE E. ANDERSON

SAMUEL WAUGHTEL, JR.

R. MASON SCHEETZ

HUGH H. HURLEY

★

Wallace E. Anderson has been promoted to division superintendent of the newly created Precision Tool & Gage Division of the Brown & Sharpe Mfg. Co. Samuel H. Waughtel, Jr., was also named division foreman as part of Anderson's organization. Since serving his apprenticeship with the company Anderson has completed many important assignments in both production and sales, his most recent position being within the sales organization. Waughtel has been with the company since 1937, and will be responsible for the production of precision tools.

★

R. Mason Scheetz has been appointed district manager of sales for Columbia Steel & Shafting Co. and its Summerill Tubing Co. Division in the Philadelphia-New York area, effective immediately. His headquarters will be the company's established branch office for this district, located at 7616 City Line Ave., Philadelphia.

★

Hugh H. Hurley, a leading authority on welding problems common to railroading, heads a new railroad welding advisory service. This service has been inaugurated by Eutectic Welding Alloys Corporation to give the American railroads the benefit of specialized experience in the use of low-temperature welding alloys.

★

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...Designed for Carbides!
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ABRASIVES DIVISION, Dept. D
ELGIN NATIONAL WATCH COMPANY
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ELGINS
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. . . Rotary Gang Slitters, from page 108

Thus if 20 strands are cut from the width, the output would be 3150 F.P.M. A 36" wide sheet slitter with one operator and a helper have slit 56 tons of sheets in an 8 hour day in sheets .002" to .030" thick. Modern slitters can slit coils and sheets ranging in thickness from .003" to .250" depending upon the machine.

Economy is greatly evidenced where accuracy is required as to parallelism and width tolerances in the slit strand. Such accuracy is required where the strands are fed through cold roll forming machines to produce structural sections for aircraft structures, metal storm windows, venetian blinds, and for the automotive industry.

Today's slitters are capable of maintaining width tolerances as close as plus or minus .002". The cutters must, however, be kept sharp and mounted on the slitter arbors with the correct and uniform clearances.

We have seen that for the slitting of sheets in a single machine with sheet entry and exit tables is sufficient. However, for the slitting of coiled sheets the following four basic units are required and are generally referred to as a "Slitting Line:"

(1) Uncoiler or pay-off reel.

(2) Rotary gang slitter.

(3) A scrap disposal unit for the trimmings from the coil edges.

(4) A recoiler or rewinder.

The advantage to a fabricator in having a slitting line is that it enables him to operate with much smaller inventories, because with a small stock of mill-width coils, he can in a few hours be ready to meet any expected or unexpected need for "slit-to-width" strands.

Also, where a slitter is available to the fabricator his production planning is facilitated, and production schedules can more easily be changed to meet day to day developments.

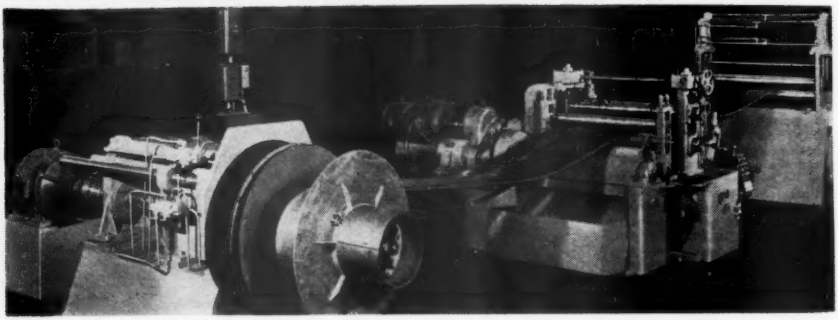
Contrary to the belief of the inexperienced, high slitting speeds are not required to gain good production. It is the handling of the coils in loading, threading, attaching strands to the recoiler, and finally stripping and banding the strands at the recoiler end that require time, and this time is usually the same whether the coils are 5,000 lbs. or 10,000 lbs. in weight. The actual slitting usually requires only about 15% of the handling time.

A typical coil slitting line is one that handles coiled sheets 36" wide, a coil I. D. of 16", a coil O. D. of 32" and weighing about 5500 lbs.

With a slitter crew consisting of an operator and two helpers and coils as indicated above these men can average one coil every half hour, or a total of 44 tons in an eight hour day.

Even a small production requirement will pay for a slitting line. For example, with production requirements of but 40 tons per week or 2000 tons per year, and at a price of ½ cent per pound for slitting, charges would be around $20,000 plus money for size extras, extra freight and handling. This amount would be sufficient to cover production costs, plus depreciation and interest on the investment in a slitting line.

A 36" line including uncoiler (not shown), stock flattener, slitter, scrap chopper and recoiler.



"More than 98% of our 27,000 employees have enrolled in the Payroll Savings Plan."

JOHN E. GOBLE
President, National Tube Division
U. S. Steel Corporation

"We of the National Tube Division of the United States Steel, recognize that systematic saving through the Payroll Deduction Plan is an investment in the security of the Nation, as well as of the individual. We are proud of the participation resulting from a person-to-person canvass in our plants and offices. More than 98% of our 27,000 employees have enrolled in the Payroll Savings Plan—a complete affirmation of their faith in America. Such personal savings are the backbone of our free enterprise system."

Concisely, clearly, Mr. Goble cites two of the reasons why 98% of the 27,000 employees of National Tube are enrolled in the Payroll Savings Plan:

- recognition by management that the Payroll Savings Plan contributes "to the security of the Nation as well as of the individual."
- a person-to-person canvass in plants and offices placed a Payroll Savings application in the hands of every National Tube employee.

There is still another reason for National Tube's outstanding employee participation; *Mr. Goble's personal interest in the Payroll Savings Plan, and the conducting of the person-to-person canvass.*

Phone, wire or write to Savings Bond Division, U.S. Treasury Department, Washington Building, Washington, D.C. Your State Director will be glad to help you build your Payroll Savings Plan.

The U. S. Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and

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SEE ADVERTISERS INDEX, BACK OF BOOK, FOR KEY NUMBERS

. . . Magnetic Piercing, from page 100

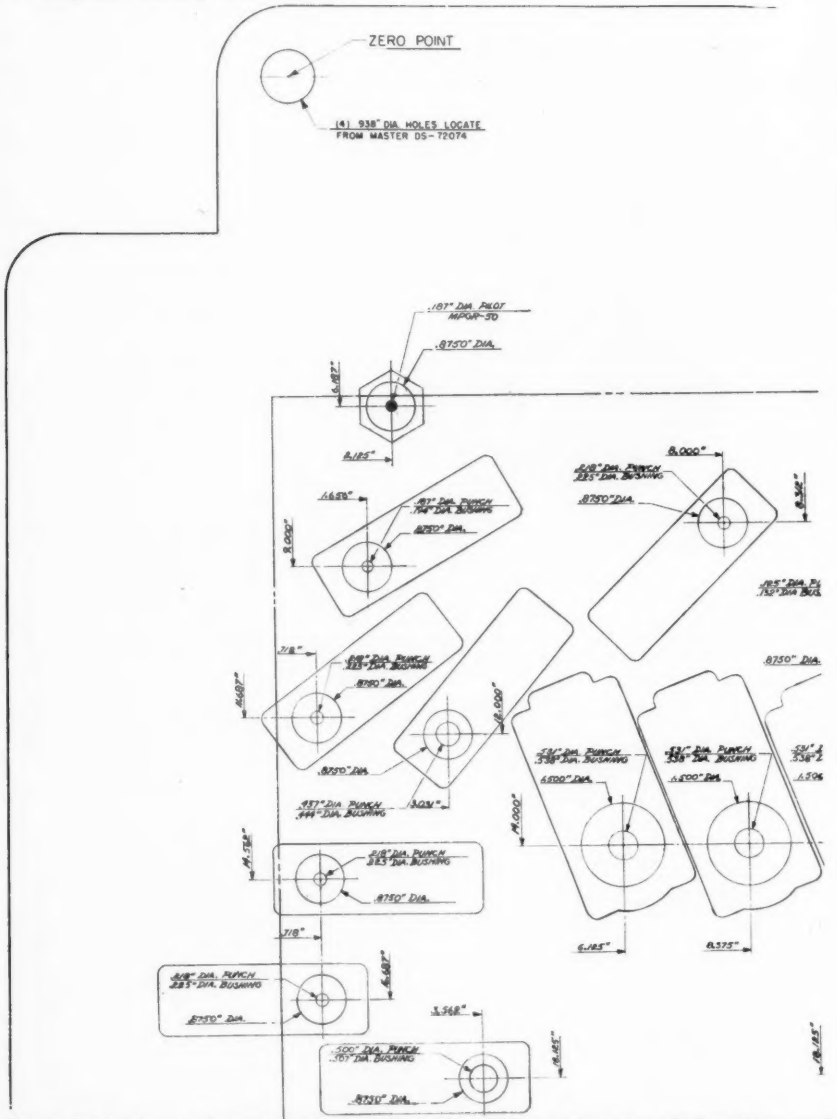
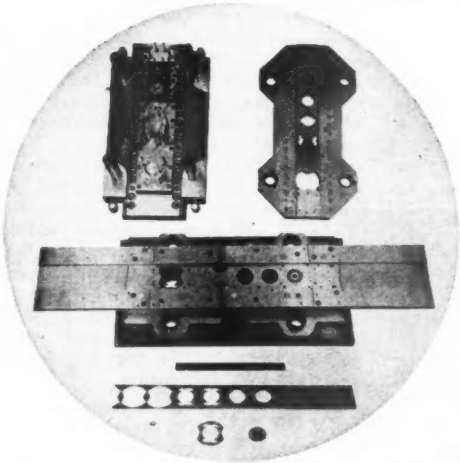


Fig. 4. Typical layout of setup, showing coordinate dimensioning of templates which position punch and bushing sets. Only a section of the layout is illustrated here. Jig-bore operator is concerned only with location and size of major hole diameters. Setup man is guided by punch point and bushing I. D. sizes. Pilot pins for locating stock is called for at upper left and lower right.

(Continued on page 196)

This die was not just "made"... it was ENGINEERED



Just a choice of words, you say? No, it's more than that. The progressive steel lamination die shown here was hole-bored, hole-ground and contour-ground to pre-engineered dimensions entirely on Moore-built machines in the Moore toolroom. It exemplifies the application of *engineering* principles that put die-making on an interchangeable parts-and-assembly basis for the first time.

Let's take a close look at this die: All die sections are mounted in a hardened nickel-chrome frame for maximum production and die life; the die set was specially made by Moore. The spring stripper is guided on four main posts. High-speed inserts are set into hardened steel frames.

Moore produced all parts of the die *to figures instead of to "fit."* This was done concurrently by several toolmakers instead of progressively as a slow, one-man job.

Precision Hole Location and Contour Grinding Methods Assure Accuracy, Speed, Economy

THE NO. 2 MOORE JIG BORER bored all holes before hardening, thus holding the location as close as possible to eliminate excessive grinding. With its built-in system of accurate lead screws, the Moore Jig Borer can spot, drill, bore or ream all holes in a workpiece with minimum tool changes and to close tolerances.

No. 2 MOORE JIG BORER

Punches and dies of the first station—at the right in the photograph—were ground with a *Moore Panto-Crush Wheel Dresser*. This machine, which combines roll-crushing and diamond dressing, did the required linear contour grinding quickly and efficiently. *Moore Motorized Centers* handled several of the smaller grinding jobs.

WITH THE NO. 2 MOORE JIG GRINDER, all die sections were screwed and doweled into place, put on the machine and ground in *one* set-up. This eliminated separate section hole-grinding and the accompanying difficulty of accurately locating each section in the die bed. The Jig Grinder does the job in one-third the time required by previous methods.

To grind Stations 2, 3, 4, 5 and 6, the new contour-grinding and slot-grinding features of the Jig Grinder were utilized.

Die try-out and assembly operations were performed the modern, fast, "mechanized" way on the *Moore Die Flipper*.

No. 2 MOORE JIG GRINDER

End results? Moore equipment brings true interchangeability to the toolroom, lowers tool costs, increases toolroom capacity, prolongs die life and achieves greater accuracy.

Detailed bulletins on these machines are yours for the asking—today. Write to: Moore Special Tool Company, Inc., 726 Union Avenue, Bridgeport 7, Conn.

ADD (GOOD TASTE) TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTO-CRUSH WHEEL DRESSERS
DIE FLIPPERS • MOTORIZED CENTERS • HOLE LOCATION ACCESSORIES

Novel Visual Approach In Technical Education Used By Steel Founders

Cleveland—(Special)—Using a brand-new visual approach to technical education, the Steel Founders' Society of America is preparing to carry the story of steel castings to student groups in all leading engineering schools of the nation during the 1952-53 college terms. Announcement of the expanded program was made here by F. Kermit Donaldson, ex-executive vice president.

Recognizing the increasing emphasis being directed to engineering materials studies, the Society has developed eleven new portable display panels especially designed to carry basic information on steel castings to engineering student and faculty groups in their own classrooms and lecture halls. The new panels supplant an original set of eleven which have been displayed for extended periods in more than one hundred and twenty engineering colleges and universities since initiation of the novel educational program.

Dramatizing the steel castings theme by use of color, animation, and illumination, the four by six foot panels operate electrically, flashing a series of kodachrome picture combinations featuring significant steel castings applications selected to meet exacting engineering and design requirements.

Once a panel is installed in its university setting, a single push-button activates the specially-built mechanism. Subsequent, successive flashes illuminate the series of kodachrome insets in sequence, giving dramatic effect to recognized steel casting advantages and utility as a versatile, dependable, and economical engineering method rendering service in more than one hundred basic industries.

One large color inset, for example, emphasises important engineering characteristics, listing such proven advantages as uniformity of structure obtainable through the use of cast steel parts, proper distribution of metal in the casting process, broad choice of mechanical properties, good machinability, dimensional stability, ease

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of welding, fatigue resistance, and overall economy in production.

Other kodachrome insets highlight typically important industrial applications and serve to dramatize visually the overall panel theme of casting versatility using steel: "Steel Castings—Basic to Industry—One ounce to 400,000 Pounds." For example, one color inset displays a layout of cast steel valves, superimposed on a refinery background, symbolizing a typical steel casting application among many important to the fuel industries. Other examples show, in sequence, typical basic applications in the power, armaments, and transportation fields: intricate and massive turbine units, aircraft jet-engine parts, heavy-duty railway components.

As an adjunct to the pictorial story told through the panel, opportunity also is provided for students to obtain authoritative published information on steel casting products and processes, design considerations, properties, and general data. Free postal card request forms are made available in a box attached to each display panel, offering various comprehensive Society technical publications.

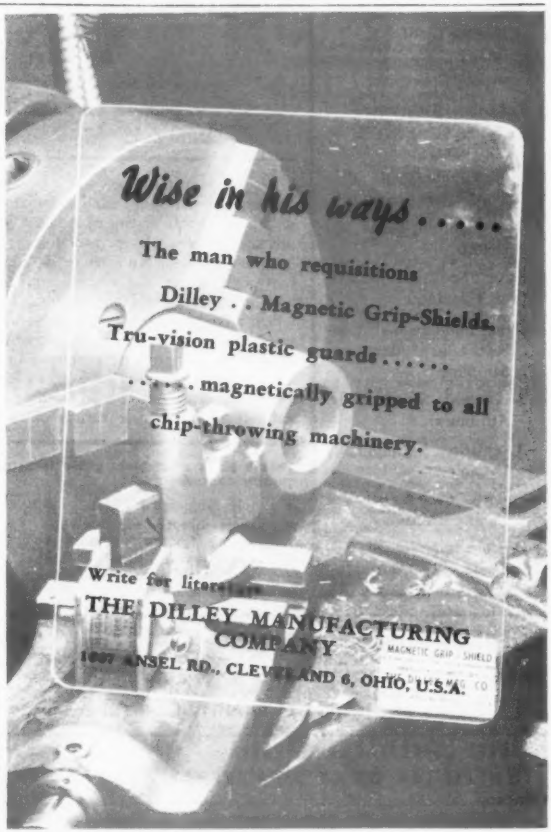
In all, the Society's pending schedule calls for showing of individual panels in one hundred and twenty-eight leading engineering colleges across the country, in eight geographical districts corresponding to the national technical group's organizational divisions. Individual steel casting executives are assisting in the educational effort in each instance.

As an indication of the exceptional scope of student and faculty interest inspired by the panel project, Mr. Donaldson said that to date the Society has received more than 4,800 request cards.

Plant Maintenance Show and Conference

A twelve-man group of industry executives, principally advertising and sales heads, has been chosen for the advisory board of the Plant Maintenance Show and Conference, to be held at the Public Auditorium, Cleveland, from January 19th to 22nd. More than 60 sessions are on schedule.

Both show and conference have been planned on a scale never before attempted in the maintenance field. Three hundred and fifty companies are expected to conduct exhibits, with some displays to be larger than 3,000 square feet. Virtually every industry will have its maintenance problems discussed in separate sessions.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HOW TO install the statistical method of quality control .. *to reduce costs, and improve product quality*

The statistical method of quality control will enable you to secure the best possible quality assurance from a given inspection cost. This book explains fully the use of this production-line technique in reducing the cost of spoilage and rework.

This partial listing of chapters indicates the scope of this book . . .

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—Some Fundamental Statistical Concepts

—Different Adaptations of the Control Chart for Variables

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—The Control Chart for Defects

—Some Statistical Aspects of Tolerances

—Some Fundamental Concepts in Acceptance Sampling

—Acceptance Sampling by Attributes

—Acceptance Sampling by Variables

—Some Cost Aspects of Quality Decisions

—Organization for Statistical Quality Control

Just Published—New Second Edition

STATISTICAL QUALITY CONTROL

By Eugene L. Grant

Professor of Economics of Engineering, Stanford University

Second Edition, 557 pages, 6x9, 94 illustrations, 19 tables, $6.50

With this industrial tool you can secure top-notch coordination of design, production, personnel, and inspection. This book shows you how to set up an expert system of quality control in your plant with immediate, practical results. Its presentation is geared to manufacturing men who have no previous knowledge of statistics or the mathematics of probability. It is for the engineer in industry, the production and inspection executives, and management men. Concentrating on techniques which have proved to be the most broadly useful and most readily understood and applied, the book demonstrates the value of the control chart in dealing with quality problems in mass production. The book shows how statistical quality control can be applied to any number of departments simultaneously, and indicates through the illustrated examples, something of the wide variety of industries in which it may be applied.

This book is a complete guide to actual techniques of installing statistical quality control

- simple language is used
- explicit directions are given for the use of the various techniques
- 46 case-histories illustrate actual control chart use in specific manufacturing operations
- no special knowledge of statistics or mathematics is required
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Ohio Customers Add 3% Sales Tax.

40th Annual National Safety Congress

One of the biggest birthday parties to be held anywhere this year will be the 40th annual National Safety Congress in Chicago Oct. 20-24. The Congress is the annual convention of members of the National Safety Council, and the Council is planning to make the one this year something special in celebration of 40 years of steady development in accident prevention.

It was in October of 1912 that a group of safety engineers for various steel companies met at the Hotel Pfister in Milwaukee in the First Cooperative Safety Congress and they were determined to put a stop to the accidents that were happening too often in the steel mills.

Out of their discussions in that six-day meeting came the National Industrial Safety Council. The Council soon shed the word "industrial" and became the National Safety Council, the clearing house and major-domo of organized safety today.

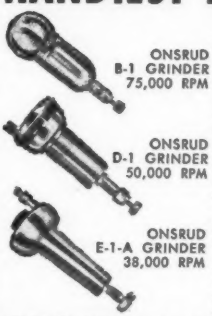
When the 40th annual Congress convenes this fall, it will take five big hotels to hold the convention. More than 12,000 safety people from all over the world will attend. More than 600 speakers will appear at 200 sessions, covering every conceivable phase of safety. In addition, the Congress exposition will contain about 250 exhibits covering all types of safety aids.

Throughout the Congress emphasis will be placed on the progress that has been made in accident prevention in the four decades that have followed the first Congress in Milwaukee. But no effort will be made to minimize the size of the accident toll today and the huge problem it presents.

The National Safety Council estimates that 500,000 lives have been saved through the combined efforts of thousands of safety people since the organized effort to cut the accident toll began 40 years ago. This figure is based on the accidental death rate in 1913 and the rates for succeeding years.

Theme of the 40th Congress will be the need for cooperation in the safety movement. Ned H. Dearborn, president of the Council, has made cooperation his chief goal since assuming presidency of the Council 10 years ago.

HANDIEST TOOL in your plant!



You'll find endless uses in your plant, machine shop, or tool and die room, for these lightweight, high speed Onsrud Air Turbine Grinders. Handle small grinding or material removal jobs on any kind of metal. Proper speed for effective fast grinding . . . powered to hold RPM under load.

Speed up finishing work on dies and cutters in the tool room . . . using small grinding wheels and rotary files . . . and new carbide burrs.

In production work, Onsrud Air Turbine Grinders are used to remove burrs and fins from castings, drill small holes, perform numerous internal grinding operations.

Choice of three precision built models for your most exacting jobs. Write us today for Grinder Bulletin 1129.

ONSRUD MACHINE WORKS, INC.

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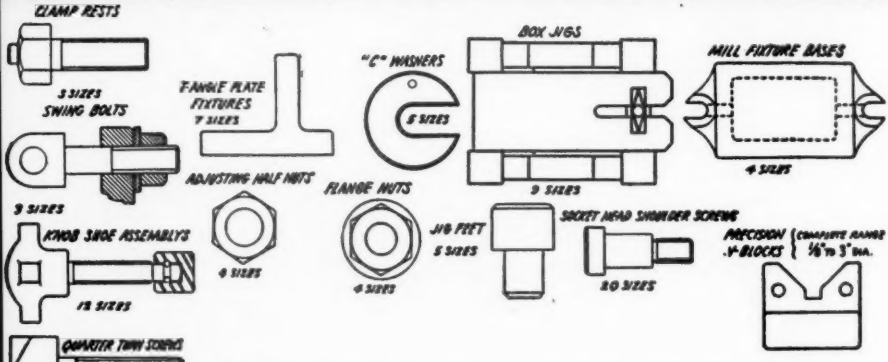

The rush is on . . . manpower shortages are here! Don't waste the valuable time of your designers and toolmakers in custom-building jig and fixture components.

Now is the time to use Noble & Stanton *Standard* Jig and Fixture Parts. Adopt them as standards in your plant. They're the best you can buy—are tough and durable—will never fail on the job—can be used over and over again.

Noble & Stanton Components are precision made from quality steels. NS parts are turned from solid stock—not welded or brazed. They're heat treated and hard chrome plated wherever practicable.

Write today for full information on the Noble & Stanton line of over 300 parts. They cost less than one-third the cost of toolroom manufacture. Tracing sheets are available for every part—saving you design time. Try a few of the items—or stock the whole line!

WRITE FOR CATALOG. Send today for this free 52-page book of drawings, specifications and prices.

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3	20	34	51	88	113	130	142	157	167A	176B	181C	191C	198D	203
5	21	35	52	89	115	131	143	158A	167B	177A	182A	192	198E	204
6	22	36	53	91	116	132	144	158B	167C	177B	182B	193	198F	
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10	26	42	57	99	120	136	148	161A	171A	179A	184	195B	198K	
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12	28	44	60	103	124	139A	151A	163A	171C	179C	185B	197A	198M	
13	29	46	79	105	125	139B	151B	163B	171D	180A	185C	197B	198N	
14	30	47	81	107	126	139C	153A	163C	173A	180B	187A	197C	199A	
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3	20	34	51	88	113	130	142	157	167A	176B	181C	191C	198D	203
5	21	35	52	89	115	131	143	158A	167B	177A	182A	192	198E	204
6	22	36	53	91	116	132	144	158B	167C	177B	182B	193	198F	
7	23	38	54	93	117	133	145	158C	167D	178A	182C	194A	198G	
8	24	39	55	95	118	134	146	158D	169A	178B	183A	194B	198H	
9	25	40	56	97	119	135	147	159	169B	178C	183B	195A	198J	
10	26	42	57	99	120	136	148	161A	171A	179A	184	195B	198K	
11	27	43	58	101	123	137	149	161B	171B	179B	185A	196	198L	
12	28	44	60	103	124	139A	151A	163A	171C	179C	185B	197A	198M	
13	29	46	79	105	125	139B	151B	163B	171D	180A	185C	197B	198N	
14	30	47	81	107	126	139C	153A	163C	173A	180B	187A	197C	199A	
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A2	A11	A20	A29	B9	B18	B27	B36	B45	B54	B63	E4	E13	E22
A3	A12	A21	B1	B10	B19	B28	B37	B46	B55	C1	E5	E14	E23
A4	A13	A22	B2	B11	B20	B29	B38	B47	B56	C2	E6	E15	E24
A5	A14	A23	B3	B12	B21	B30	B39	B48	B57	C3	E7	E16	
A6	A15	A24	B4	B13	B22	B31	B40	B49	B58	C4	E8	E17	
A7	A16	A25	B5	B14	B23	B32	B41	B50	B59	C5	E9	E18	
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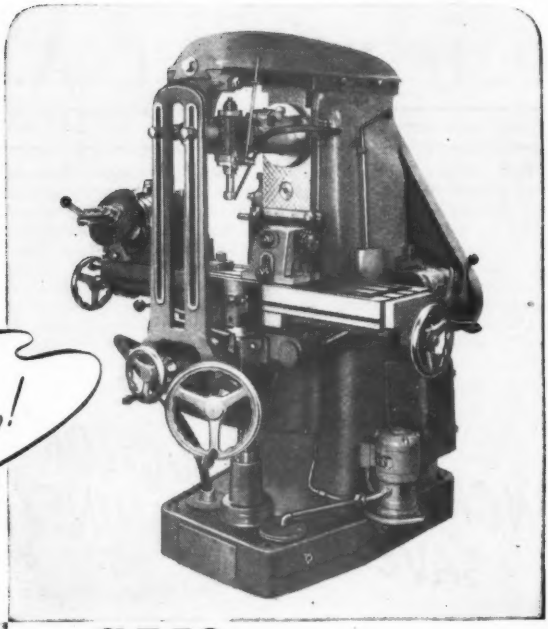

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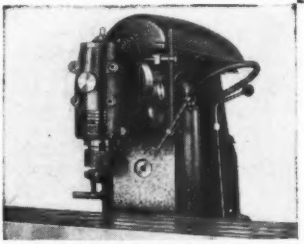

Sajo Vertical Milling Attachment

The Sajo "Plain" Milling Machine

the SAJO "UNIVERSAL" MILLING MACHINE

exemplifies the expert workmanship that is traditional in Swedish machine tools. Like all SAJO Millers, this new Universal Milling Machine was designed and built to the highest standards of quality and practical utility.

Avoidance of exterior "luxury" features, slight in value but substantial in cost, and concentration on the vital factors of construction, enable the SAJO to deliver top performance at moderate cost.

SAJO Millers are available in Plain and Universal types, with longitudinal power table feed only, or with power feed in all directions. Screws and dials are in the U. S. inch system.

★ **Standard Equipment includes:**
3 HP motor and starter equipment, motor driven coolant system, adjustable table feed nut to allow climb-milling, 1" arbor, arbor support brace.

★ **Extra Equipment:**
Universal Dividing Head, Vertical Milling Attachment, Slotting Attachment, Swivel Base Vise, Rotary Table.

CONDENSED SPECIFICATIONS

Table Size	41⅛" x 9¼"
Longitudinal travel: Plain Miller	24⅛"
Universal Miller	27⅛"
Transverse travel	8¼"
Vertical travel	19"
12 spindle speeds	36-1540 RPM
Table feeds	12
Taper in spindle	No. 40 NMT
Main motor	3 HP

Precision anti-friction bearings on spindle and gear shafts
One-piece column and base
Net weight—2200 lbs.

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AUSTIN INDUSTRIAL CORP. 76-X MAMARONECK AVE. WHITE PLAINS, N. Y.
DEALERS IN PRINCIPAL CITIES

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Keep Informed! CATALOGS • BULLETINS • SPECIFICATIONS

R. B. Cutting Tools In Tungsten Cobalt High Speed Steel are combined in sets Nos. 106B-K. Each set consists of holder and 20 tools. Data sheet BE 15a from the R. B. Tool Company, Hartsdale, N. Y., contains details of these and other combination sets for boring, threading, facing and recessing.

Circle Inform-A-Gram No. B1.

"Hefti-Cut" Cutting Tool by DoALL is especially designed for heavy duty turning, facing, shaping, and boring operations. Bulletin #52-800 describes available range and styles, gives complete information on the unique two-way blank adjustment for maximum performance and economy. DoALL Company, Des Plaines, Ill.

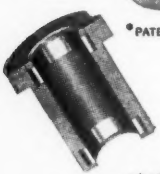
Circle Inform-A-Gram No. B2.

INCREASE PRODUCTION.. SAVE TIME & MONEY ON YOUR DRILLING OPERATIONS

MEYCO

Carbide Inserted Bushings last longer, cost less in the long run

*PATENTED



Here is a bushing that combines the best features of steel and carbide; the strength of steel and the long life of carbide. First cost: slightly higher than ordinary steel bushings; their life: many, many times as great. In addition to such obvious savings, MEYCO bushings increase the life of drills and reamers, produce accurate work for a longer period of time, save on machine-down time and on nonproductive man-hours.

☆

Auto manufacturer says: "... the steel bushings previously used averaged about 28 hours life. MEYCO bushings ran 1,168 hours before they were unusable."

For information and prices write for Meyco Bushing Catalog No. 17.

W. F. MEYERS CO., INC., BEDFORD, INDIANA

"The Facts About Weldments and Castings" is the title of new booklet from Acme Tank & Welding, 1023 New Britain Avenue, West Hartford, Conn. It is directed towards manufacturers and designers of heavy machinery, equipment, service apparatus and components. It gives basic facts on steel plate fabrication versus castings for purchasing agents, design engineers, and production executives. It will be especially interesting to management men who are at present specifying castings for their requirements.

Circle Inform-A-Gram No. B3.

"Engraving Machines and Accessories" is title of new color folder available from H. P. Preis Engraving Machine Co., 282 Industrial Branch, Hillside, N. J. Four different styles of machine and hand engraving machines are featured, together with such well-proven Preis accessories as the electro-marker, model CG panto cutter grinder, and the universal work-holding fixture. One page is devoted to the different type cutters now available from stock.

Circle Inform-A-Gram No. B4.

"Dag" Colloidal Graphite is Chemically Inert. Used as a dry-film lubricant, its insolubility in acids and alkalies prevents chemical reaction with corrosive materials and subsequent loss of lubricating ability. It resists oxidation at temperatures up to 500° C., and will withstand heat far better than conventional petroleum lubricants. Bulletin 435 from Acheson Colloids Company, Div. of Acheson Industries Inc., Port Huron, Michigan, should be of great interest to anyone faced with a difficult lubrication problem.

Circle Inform-A-Gram No. B5.

PREVIEWS

Circle postage-free Inform-A-Gram Key Number for your request

Reid Model 618 Grinder incorporates variable table speed to solve the problem of correctly grinding the various metals and materials now finding increasing uses in modern manufacturing. Table speed can be varied between 12 and 35 feet a minute by simply turning a handwheel. New bulletin from the Reid Brothers Company, Beverly, Mass., details four models of the 618, together with complete attachments and accessories.
Circle Inform-A-Gram No. B6.

Detrex 61 is New Cleaner for Deep Drawn or Extruded Steel. It is used in a soak tank at approximately 190° F at a concentration from 6 to 10 ounces per gallon. It completely removes oil, grease, and dirt from all ferrous parts. In addition to possessing high wetting and penetrating properties Detrex 61 is very free rinsing. Detrex Corporation, Detroit 32, Mich.
Circle Inform-A-Gram No. B7.

Case Histories of New and Rebuilt Machine Tools are contained in the first issue of a new quarterly publication issued by Simmons Machine Tool Corporation, 1700 North Broadway, Albany 1, N. Y. Included in this first issue, called "The Simmons Way", are examples showing how the Simmons 6" bar horizontal boring and facing machine has been adapted for special deep boring operations at Ingersoll-Rand Co. and De Laval Steam Turbine Co. Another section is devoted to pictorial, step-by-step descriptions of the significant operations in engineered rebuilding of machine tools carried out by the company. Mailing list for this and future issues is now being formed.
Circle Inform-A-Gram No. B8.

The Green Engraver is Compact and Versatile. It will engrave, route, and do third dimensional modeling in a very wide range of materials. A two-color brochure recently issued by the Green Instrument Co., 380 Putnam Ave., Cambridge, Mass., gives details of applications and attachments. Copies will be sent on request.
Circle Inform-A-Gram No. B9.

Data Sheet on Latrobe "Desegatized" HV-6 High Speed Steel is now available from the Latrobe Steel Company, Latrobe, Pa. Typical analysis figures are given, together with forging, hardening, annealing and tempering recommendations. Charts are furnished on hardening and tempering data.
Circle Inform-A-Gram No. B10.

More Lathe Output

PER MAN-HOUR!
PER MACHINE!

Easy with
IDEAL Live Centers
for light or heavy turning

Make deeper cuts at faster speeds . . . No gouging or burning . . . No spoilage or rework . . . Precision-built for micrometer accuracy. "Multi-Duty" Models available with male, female and pipe points. "Heavy-Duty" Models for BIG jobs. All standard sizes.

Sold Through Leading Distributors

"TURNS WITH THE WORK"

Mail- FOR FULL DETAILS

IDEAL INDUSTRIES, Inc. IDEAL
4151 Park Avenue, Sycamore, Illinois
Please rush catalog information on IDEAL Live Centers
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COMPANY
ADDRESS
CITY ZONE STATE

New Bryant Gage Rapidly Checks Accumulated Error of Thread Elements, completely eliminates guess-work in determining the fit of a given thread. It is built on the principle of an "expanding" master plug for checking internal parts, or a "contracting" master ring for checking external threads, and in addition to checking the accumulated error, also gives an accurate reading of roundness. A new catalog from the Bryant Chucking Grinder Co., Springfield, Vt., gives full details of the Bryant No. 11 and other gages, with accessories and specifications.

Circle Inform-A-Gram No. B11.

The Bath Contour Former combines three principle methods for work forming. Stretch, compression, and radial draw forming are all possible with the same equipment. With the selection of available accessories this machine can be equipped for almost any forming job. A new catalog of 32 pages from the Cyril Bath Company, 6880, Machinery Ave., Cleveland 3, Ohio, gives detailed, illustrated applications. The machine is particularly suited for such forming the new high-cost alloys now finding increasingly important applications in industry.

Circle Inform-A-Gram No. B12.

Drill Hardened Steels without Annealing –

With the new, improved "HARDSTEEL" Drill, you can do accurate, smooth drilling, countersinking, counterboring and reaming in steels hardened by any process without first annealing the work. And they work with equal ease on work-hardening steels and high carbon–high chrome steels of any degree of hardness.

"HARDSTEEL" Drills fit standard drill presses. They save time and reduce rejects. They permit engineering changes requiring additional drilling after hardening. And parts drilled after hardening always match at assembly.

Write for a copy of the "HARDSTEEL" Operators Manual showing how "HARDSTEEL" drills are cutting costs in thousands of plants.

You Harden It—We'll Drill It—With "HARDSTEEL"

BLACK DRILL COMPANY, INC.
1368 East 222nd St. • Cleveland 17, Ohio

Also makers of— **BLACK DRILLING UNITS—AUTOMATIC, SELF-CONTAINED—FOR COST-CUTTING PRODUCTION ON ALL MATERIALS**
Write for information

17 Ways to Increase Heat Treating Efficiency with submerged electrode salt baths are described in a new bulletin 123-B from the Ajax Electric Co., Inc., Frankford at Delaware Ave., Philadelphia 23, Pa. Bulletin deals with ten specific applications in the temperature range from 1100°-F to 2400°F. Submerged electrode furnaces are a recent innovation by this company.

Circle Inform-A-Gram No. B13.

True-Point Live Centers by Spendrup Inc., 37 Wall St., New York 5, N. Y. are precision engineered for long-lived accuracy. Bearings are by SKF and the point is ground after assembly, guaranteeing greatest possible concentricity. Housing and point are hardened and ground, while the point is made from fine Swedish tool steel. Data sheet from the maker gives full details of the line carried, with dimensions, specifications, and load rating charts.

Circle Inform-A-Gram No. B14.

Air or Hydraulic Machine Vises are described in a data sheet from Production Devices Inc., Whitehall, N. Y. Patented wedge and lever action utilizes total cylinder drive, providing positive grip even under condition of high vibration, making these "Airlox" vises especially suited to carbide milling operations. Price lists and accessory details are given.

Circle Inform-A-Gram No. B15.

Pipe, Conduit, and Tube Bending Machines in a complete range of hand and power models are described in the latest catalog sheet from the "American" Pipe Bending Machine Co., Inc., 15 Furnace St., Poultney, Vermont. The range covers pipe sizes from ¼" to 8". Standard radii are stocked in complete listing, special radii made to customer specification with minimum time loss.

Circle Inform-A-Gram No. B16.

Turchan Hydraulic Duplicator Applications are the subject of a newly released catalog from the Turchan Follower Machine Company, 8259 Livernois Ave., Detroit 4, Mich. Circuit and attachment drawings are given, and equipment is pictured on all types of machines doing all kinds of jobs, from duplicating a small die on a mill to contouring and profiling on a large boring mill. Section on Turchan dual follower for rapid and accurate work in complicated lathe setups is especially interesting.

Circle Inform-A-Gram No. B17.

"The Answer to Industrial Dermatitis . . ." Literature on "Skin-Cote", from the Boyer-Campbell Company, 6540 St. Antoine St., Detroit 2, Mich., gives details and case histories of applications of the different grades of this protective cream. A comprehensive chart of chemicals and processes and the different types of "Skin-Cote" recommended for each is included.

Circle Inform-A-Gram No. B18.

Revised Rapistan Conveying Equipment Catalog Published. Copies may be had from the Rapids-Standard Co., Inc., Dept., GC Rapistan Bldg., Grand Rapids 2, Mich. Several new items are announced for the first time. Section 1 has full details on steel and lightweight aluminum wheel and roller gravity conveyors and a wide range of accessories. Included is information on new industrial "Rapid-Wheel" conveyor, a five foot section of which will handle up to a ton of distributed weight; on a low-cost portable cleated-belt conveyor; and on a "Table-Veyor" unit for assembly, inspection, and similar uses. Remainder of catalog deals with hand and shelf stock trucks, industrial casters and wheels, has helpful tips on correct model selection for varied load and floor conditions.

Circle Inform-A-Gram No. B19.

Hydraulic Lift Trucks are described in bulletin 525 from the Barrett-Cravens Company, 4609 S. Western Blvd., Chicago 9, Ill. These trucks are designed for easy one-man handling of heavy loads, have a 6" lift as standard, and are made in three models with 2500, 4000, and 6000 lbs. capacity respectively. Load lifting to travel height is accomplished with as many or as few strokes of the handle as may be desired, long strokes, for a quick lift or short strokes for a heavy load. The hydraulic unit is self-contained and easily removable for quick servicing.

Circle Inform-A-Gram No. B20.

New Bushing for "Vari-Pitch" Sheave by Allis-Chalmers gives dual installation advantages. The sheave may be quickly installed or removed, and may be mounted on the shaft so that the adjusting control mechanism is either towards or away from the motor bearing. In addition the sheave with bushing is about 20% lighter than the former style control sheave. Leaflet 20S7811 from the Allis-Chalmers Manufacturing Co., 1013 S. 70th St., Milwaukee, Wis., gives dimensions and engineering information on the complete installation of bushing, sheave, and drive.

Circle Inform-A-Gram No. B21.

Save Money
ON PRECISION
DIE CUT STAMPINGS
IN SMALL LOTS
FOR EXAMPLE:—
The close tolerance stamping shown above was produced by our exclusive, low-cost WLS Speedtooling Method at a cost of
$62.00 for first 100 pieces.
$9.20 for each additional 100.
Proportionately low prices will apply to die stamped parts that you require — any size or shape up to 5/16" thick. Average die life — up to 100,000 pieces.
OUR SPECIALTY—
Short Run Stampings
WLS Speedtooling
method assures low die cost on small, irregular shaped parts, stamped, formed, pierced, extruded, stencilled, tapped, countersunk.
WRITE OR WIRE FOR NEW
FREE BULLETIN
Illustrates 40 Small Stampings
Send Your Prints for Quotations
WLS STAMPING COMPANY
SMALL LOT STAMPINGS
3290 East 80th St.
Cleveland 4, Ohio

Data Card on Carbon Steel Tubing for Pressure Uses is offered by the Tubular Products Division, Babcock & Wilcox Company, Beaver Falls, Pa. Bulletin number is TDC 142, and the information included is valuable to engineers and designers associated with the fabrication of equipment operating at elevated temperatures and pressures. Condensed data is given on mechanical and physical properties, upsetting, swaging, flanging, expanding, bending, and welding of seamless and welded carbon steel tubing.
Circle Inform-A-Gram No. B22.

Rapid Cleaning of Aluminum, anodized aluminum and magnesium parts in power washing equipment is made possible with the development of a new detergent by Kelite Products, Inc., 1250 North Main St., Los Angeles 12, Calif. Known as Kelite PWB No. 81, the new detergent is a powder readily soluble in water. It affords complete removal of virtually all types of soil, including Kaiser, Alcoa, and Reynolds ink markings. It is non-foaming and non-corrosive, and has extreme stability for long life.
Circle Inform-A-Gram No. B23.

There's a reason 71%

of all popularly-priced Tool and Cutter Grinders sold in 1951 were "Knock-Outs"

MODEL B860

Will do anything that machines costing 2 or 3 times more will do . . . yes and in less time.

Distributed Only Through Franchise Dealers

K. O. LEE CO.
ABERDEEN, S. D.

WRITE FOR COMPLETE LITERATURE

"Belmalloy" is the Belle City Malleable Iron Company's brand of pearlitic malleable iron which unites strength, toughness, rigidity, wear resistance, ductility, machinability and uniform structure in one metal. New brochure from the company at Racine, Wisconsin, summarizes briefly for the engineer and buyer of castings this alloy's characteristics and physical properties. It also indicates some of the proven uses of Belmalloy castings with particular reference to the field of mobile equipment. This metal has the happy faculty of uniting some of the properties of both iron and steel castings at a price intermediate between each. It is also capable of controlled quantity production.
Circle Inform-A-Gram No. B24.

Immersion Heater Bulletin Sheet details Glorod fused quartz heater, which is totally inert to all finishing and plating solutions except HF. This portable heater accurately controls tank temperatures, heat is radiated, not conducted. Details from Cleveland Process Company, 7016 Euclid Ave., Cleveland 3, Ohio.
Circle Inform-A-Gram No. B25.

D-C Arc Welder Booklet Available from Westinghouse. Up-to-date information on engineering improvements and application refinements of the type RA d-c arc welder are offered in a new 12-page booklet from the Westinghouse Electric Corp., Box 2099, Pittsburgh 30, Pa. This welder has feature allowing the operator to adjust welding transient characteristics to suit each job. The booklet number is B-5453, and it contains not only information on the performance characteristics of the welder, but also its physical construction, electrical specifications and ratings, and approximate dimensions and weights. There is also a section on dual units, Heliarc torch welding, duplex welders, stud welding, and control attachments.
Circle Inform-A-Gram No. B26.

Dial Gage Catalog 8D from Nilsson Gage Co., Inc., Poughkeepsie, N. Y., besides being very comprehensive, covers some of the newest developments in the gaging industry. These include the smallest dial bore gage made, which has a range from 3/16" to ¼", and is equipped with spring loaded centralizing plungers; dial snap, dial groove, and groove location gages. A portable dial indicator gage for checking pitch diameters of gears and splines is given special treatment.

Circle Inform-A-Gram No. B27.

Rimat Inside Micrometers in a complete size range are listed and described in bulletin R-3 from the Rimat Machine Tool Company, 1117 Air Way, Glendale 1, Calif. Measuring tips are specially well supported for maximum accuracy; feel is positively controlled by the thimble setting.

Circle Inform-A-Gram No. B28.

"Exmet" is New Jet-Engine Alloy adapted by DoALL for use in heavy-duty lathe and grinder centers. The alloy takes the form of a replaceable accurately ground tip, inserted into the center of the shank. Complete accuracy is assured, together with minimum maintenance. Tips outwear H.S.S. ten to one, and cannot freeze in the work even though run red-hot. Bulletin 52-802, DoALL Company, Des Plaines, Ill.

Circle Inform-A-Gram No. B29.

New Bushing and Bearing Extractor is designed for use in blind holes. Will easily extract any flush set bearing, even though press-fit under five ton pressure. The extractor can handle any hole from ½" to 2" diameter, and will draw a maximum of 2½" at one setting. Literature with full details is available from the Crozier Machine Tool Co., 684 N. Prairie Ave., Hawthorne, Calif.

Circle Inform-A-Gram No. B30.

New Bliss Straight-Side, Double-Crank Presses are described and pictured in catalog 17-D from the E. W. Bliss Co., Canton, Ohio. These S-2 presses range in capacity from 50 to 2,000 tons, and incorporate dimensions and specifications established by the Joint Industry Conference. They include such features as pneumatic slide counter-balance cylinders and motorized slide adjustment as standard equipment. They are also arranged for many other accessories such as Bliss-Marquette die cushions and knockouts.

Circle Inform-A-Gram No. B31.

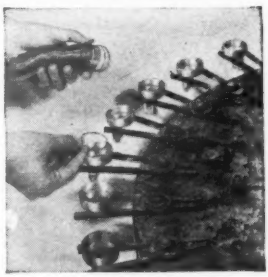
Four Federal Stamping Services are described in bulletin 161. Included are short run metal stampings, phenolic stampings special wrenches and name plates, all die stamped to your specifications. Complete die making facilities allow the company to stamp any metal, fibre, phenolic or other material that can be stamped in any quantity from 2 pieces to 10,000, and in any shape or size up to 9" by 12", in any thickness up to 3/16". Write Federal Tool & Mfg. Co., 3600 Alabama Ave., St. Louis Park, Minneapolis 16.

Circle Inform-A-Gram No. B32.

Notch-Coil Ring Design

UPS Silver Brazing Rate

56%



Coil-to-assembly in one fast and easy move. There's no tangling, distortion or material loss.

SNAP-OFF COIL, drop-on assembly feature of job-designed, easy-to-handle preforms raised brazing rate of electrical transformer connectors from 360 to 560 units per hour . . . yet equipment and procedure were the same as used before with individual, machine-wound rings.

NOTCH-COIL PROJECTS rings in handling and storage. Tangling, distortion, breakage and loss are eliminated . . . ± .001-inch tolerances under all conditions minimize amount of precious alloys needed for job.

BUTT, LAP OR GAP rings are available in *any* size, in *Silfos* or *Easy-Flo*. Stress-relieved, rings snap snugly around outer diameters, snap into inner grooves for desired fill and strong, leak-proof bond.

Guaranteed count at no extra cost!

LUCAS-MILHAUPT ENGINEERING CO.

5051 S. LAKE DRIVE, CUDAHY, WIS.

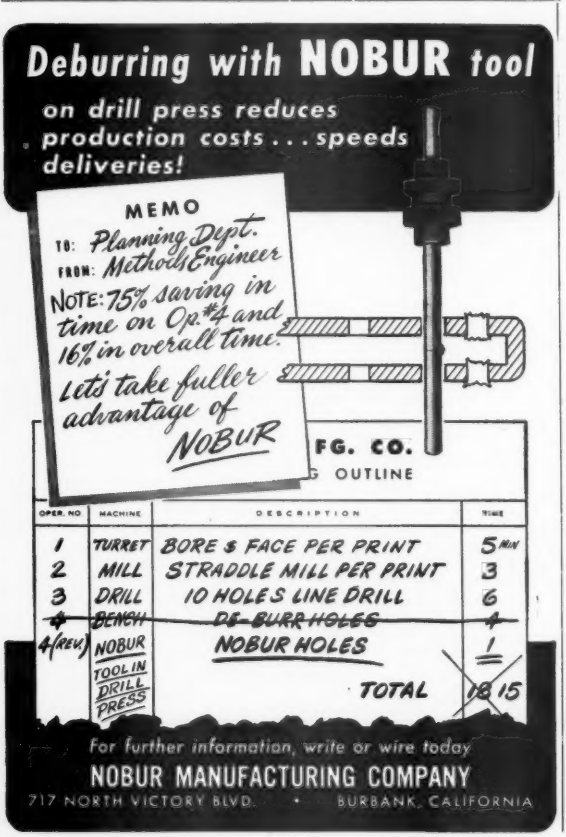
Suburb of Milwaukee, Wis.

Ampco "Welding News" contains illustrated case histories giving detailed information on pre-welding preparations, welding processes and techniques. Among the articles is one on the fabrication of floating tube sheets used in acetic acid service welded with inert gas consumable process. Other features include the correct selection of resistance welding tips, "Ampco-Facing" cast iron gears, die cutter drive shafts, bag machine drum finger cams, and soft steel sprockets. Ampco Metal Inc., 1745 S. 38th St., Milwaukee 46, Wis.

Circle Inform-A-Gram No. B33.

Fastener Specialties Handbook. New Southco release, catalog B-2, contains 22 pages of information on industrial fasteners for metal to metal and metal to wood applications. Blind rivets and a variety of door latching and fastening devices are illustrated in this two color spiral bound book which also includes several pages of frequently used engineering data. Installation procedure, sample applications, and complete dimensional information are given for all fasteners. Southco Division, South Chester Corporation, Lester, Pa.

Circle Inform-A-Gram No. B34.


Deburring with NOBUR tool
on drill press reduces production costs . . . speeds deliveries!
MEMO
TO: Planning Dept.
FROM: Methods Engineer
NOTE: 75% saving in time on Op. #4 and 16% in overall time.
Let's take fuller advantage of NOBUR
FG. CO.
OUTLINE
OPER. NO
MACHINE
DESCRIPTION
TIME
1 TURRET BORE & FACE PER PRINT 5 MIN
2 MILL STRADDLE MILL PER PRINT 3
3 DRILL 10 HOLES LINE DRILL 6
4 BENCH DE-BURR HOLES 4
4(REV) NOBUR TOOL IN DRILL PRESS NOBUR HOLES 1
TOTAL 18 15
For further information, write or wire today
NOBUR MANUFACTURING COMPANY
717 NORTH VICTORY BLVD. • BURBANK, CALIFORNIA

Cleated Belt Conveyor, the new Press-Veyor Jr., is described in an illustrated bulletin from the Rapids-Standard Company, Inc., Dept. LPV, 342 Rapistan Bldg., Grand Rapids 2, Mich. Included are drawings, photos, and specifications of a wide range of models for all materials handling in press room, forge shop, and general manufacturing industries. Construction features give light weight with strength, for portability plus long service.

Circle Inform-A-Gram No. B35.

"Kwik-Klamps" for all Work-Holding and Fixturing Operations are described in new catalong from Danly Machine Specialties, Inc., 2100 South Laramie Ave., Chicago 50, Ill. Complete engineering data on all items in the line is included together with actual illustrations. The detailed drawing accompanying each illustration is a valuable help to designers. As an additional aid, the catalog offers a complete set of scaled templates. The entire line is detailed.

Circle Inform-A-Gram No. B36.

Colonial ASA Standard Drill Jig Bushings are quantity net price listed in a new 6-page folder from Colonial Bushings Inc., 31780 Groesbeck Highway, Fraser, Mich. The list, which is a companion piece to the company's "flip-a-page" catalog B-649, covers prices of all fixed renewable, slip renewable, and head press fit jig bushings. Prices for headless, headless press fit, and head type liners are also included.

Circle Inform-A-Gram No. B37.

Cylindrical Grinding Attachment for Surface Grinders has built-in two-way sine bar tilt arrangement eliminating guesswork and simplifying the setting of taper angles with gage blocks. Bulletin 52-401 from the DoALL Co., Des Plaines, Ill., has complete details and applications.

Circle Inform-A-Gram No. B38.

The Ernst Metal Hardness Tester is completely portable and exceedingly compact. Moreover, it is accurate to plus or minus 1.5 points on the Rockwell and 5 points on the Brinell scales. Simple hand pressure of the instrument against the workpiece is enough to give a correct reading on the large dial. Almost any size, shape, and form of workpiece may be tested anywhere in the plant. Write for descriptive catalog to Newage International Inc., 235 East 42nd St., New York 17, N. Y.
Circle Inform-A-Gram No. B39.

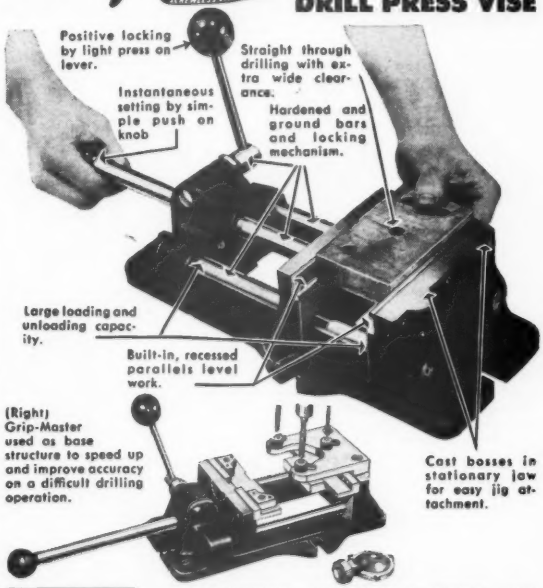
Rivett Lathe & Grinder Bulletin. The complete line of Rivett cabinet lathes, hand turret lathes, toolroom lathes, and internal and universal grinders are featured in new bulletin 500F. Descriptions of each machine are detailed, including illustrations, performance data, and specifications. Toolroom lathes are guaranteed to turn or bore within .0001" over six inches. Rivett Lathe & Grinder, Inc., Brighton 35, Boston, Mass.
Circle Inform-A-Gram No. B40.

New Heavy Duty 8" Vise Bulletin. A new bulletin is offered by the Producto Machine Co., describing their plain and swivel type heavy duty vises. Technical details are given on three models: plain vise with ground sides, plain vise with clamping ears, and swivel vise complete with graduated base. Bulletin describes how Producto vises prevent accidental milling or drilling of jaws and body of vise. Several features of interest to the machinist are: large opening between jaws, special design for proper drainage of coolant and chips, mounting on machine table can be either lengthwise or crosswise, indestructible hardened and ground guide rails, slippage prevented by serrated blocks, and provision for holding two workpieces at one time. The new bulletin is available by writing Producto Machine Co., Bridgeport 1, Conn.
Circle Inform-A-Gram No. B41.

New Bronze Welding Rod, "EutecRod" 148FC, is described in leaflet TIS-997-P, from the Eutectic Welding Alloys Corporation, 172nd St. & Northern Blvd., Flushing, New York 58, N. Y. A special flux coating permits the alloy to bond automatically even on dirty cast iron, which minimizes the possibility of weld failure, of great help in delicate repair jobs. Tensile strength is listed up to 55,000 psi., while the Brinell hardness figure is between 75 and 120. Use of the new rod eliminates most normally required prewelding operations, and always produces good flow.
Circle Inform-A-Gram No. B42.

Resistance Welding Equipment is detailed in a 48-page catalog recently published by the Multi-Hydromatic Welding and Manufacturing Co., 23171 Groesbeck Highway, East Detroit, Mich. The catalog presents each item of company equipment accompanied by specifications and photographs, and indicates the job-applications of each machine, fixture, and press. Products of the company include air and hydraulically operated resistance upsetting machines, rocker arm spot welders, projection welders, portable welders, hydromatic welders, multiple transformer welders and fixtures.
Circle Inform-A-Gram No. B43.

Speed-up DRILL PRESS OPERATIONS
WITH THE HEINRICH Grip-Master SCREWLESS DRILL PRESS VISE


Positive locking by light press on lever.
Straight through drilling with extra wide clearance.
Instantaneous setting by simple push on knob
Hardened and ground bars and locking mechanism.
Large loading and unloading capacity.
Built-in, recessed parallels level work.
(Right) Grip-Master used as base structure to speed up and improve accuracy on a difficult drilling operation.
Cast bosses in stationary jaw for easy jig attachment.

Ask your dealer for demonstration or write for details.

NATIONAL MACHINE TOOL CO.
DEPT. 132-J
RACINE, WISCONSIN

Inexpensive Small Lot Stamping. The HPL fast-tooling process permits rapid and inexpensive production of small lots of stamped parts where quantity requirements range from 25 to 25,000 pieces. The method offers great flexibility, important for experimental or development work, or where frequent design changes are to be expected. Any material that can be stamped may be blanked, pierced, drawn, or formed; while secondary operations such as extruding, drilling and stenciling can also be performed. Bulletin 718, HPL Mfg. Co., 15269 Miles Ave., Cleveland 28, Ohio.
Circle Inform-A-Gram No. B44.

New Graphitic Steel Product from Timken carries the name of "Graph-Mo Hollow-Bar", and is a turned and bored bar section which uses Timken's familiar Graph-Mo tool steel as base. It combines the advantages of graphitic type tool steel and convenience of the hollow bar section in manufacturing ring gages, dies, and other annular tool steel parts. The material will be stocked in fifteen cities throughout the country, and initial stocks will be ready for distribution this month. Stock from four inches to sixteen inches. Steel & Tube Division, Timken Roller Bearing Co., Canton 6, Ohio.
Circle Inform-A-Gram No. B45.

ARMSTRONG

Drop Forged

LATHE DOGS

ARMSTRONG Lathe Dogs give extra service because they are drop forged from selected open hearth steel, and, are heat treated to extreme toughness and stiffness. Hubs are made large enough to permit re-tapping, screws are also of special analysis steel and are hardened at the point to prevent upsetting.
ARMSTRONG Dogs come in 10 types with square head or safety headless screws, with straight or bent tails. They are carried in stock by your local ARMSTRONG Distributor.

ARMSTRONG BROS. TOOL CO.
5220 West Armstrong Ave.
Chicago 30, Ill.
New York and San Francisco

Air Hardening Tool Steel. New bulletin on "Ry-Die, a 5% chromium type air hardening tool and die steel, gives chemical analysis, hardening characteristics, wear resisting properties, instructions for heat treatment, and lists typical applications. This is a general purpose tool steel, suitable for drawing, blanking, and forming dies, gauges, forming rolls, punches, and similar uses. Write for your copy to Joseph T. Ryerson & Son Inc., P.O. Box 8000-A, Chicago 80, Ill.
Circle Inform-A-Gram No. B46.

New Meehanite Bulletin. In order to provide users of castings with an industrial cross-section of the scope of the applications of Meehanite castings, the Meehanite Metal Corp., New Rochelle, N. Y., has published a new 32-page booklet entitled "Meehanite Castings Serve All Industry." The booklet contains 43 illustrations of applications covering nearly every major industry and also complete tables of the physical properties of the materials available. Request bulletin No. 35.
Circle Inform-A-Gram No. B47.

"We Blasting In Precision Finishing' is the title of a new brochure just published by the American Wheelabrator & Equipment Corp., 1183 South Byrkit St., Mishawaka, Ind. This six page brochure shows the application of wet blasting to such work as die and mold finishing, die and mold maintenance, tool finishing and deburring, heat treat scale removal, and surface preparation for plating in all applications where close tolerances on work must be maintained. The brochure is fully illustrated, showing parts before and after wet blasting, and has typical installation photos of the cleaning process. Among industries represented by these examples are glass molding, plastic molding, extruding, and tool plating. Bulletin No. 43.
Circle Inform-A-Gram No. B48.

Kling Structural Shapes Bulletin. A new bulletin on engineered structural shapes has just been issued by Kling Bros. Engineering Works, Dept. TP, 1320 N. Kostner Ave., Chicago 51, Ill. These shapes consist of rolled or formed angles, beams, channels, bars, or rails of steel, aluminum or brass which are used in place of casting or plate cutting methods formerly employed. Typical applications include wheels, exhaust fan rings, bullwheels and pulleys, racks for pinions, and reinforcement for various purposes. Speeding of production, reduction of finish machining time, elimination of material waste, and cutting of material and labor costs are amongst the advantages gained. Copies from the manufacturer.

Circle Inform-A-Gram No. B49.

A New Cold Cement for renewing polishing wheels and abrasive belts has just been announced by the Schaffner Mfg., Co., Emsworth, Pa. The product is called "Grip-Grain", and is stated to be faster and more economical than similar products since it does not require long waiting or setting-up periods, provides greater efficiency and more pieces per head, eliminates glazing and the need for oven heating, dries rapidly at room temperatures, and cuts down time for wheel changes. It has an excellent record with emery grains from 320 to 20. Samples are being supplied to industrial users, together with catalog which is available on request.

Circle Inform-A-Gram No. B50.

"Ther-Monic" Induction Heating Facts is a 25 page bulletin which was previously restricted to field engineers of the Induction Heating Corp., Brooklyn, N. Y., and is now available in response to letterhead requests from department heads to the above company.

Circle Inform-A-Gram No. B51.

Standard Thread Gages are listed and priced in a new 20-page bulletin SG-52 by Detroit Tap & Tool Co., 415 Boulevard Building, Detroit 2, Mich. Gages priced include thread plug, thread ring and thread setting gages for machine screw and fractional thread sizes. Types and uses of thread setting plug gages are discussed, and tables listing 'W' and 'X' and 'Y' tolerances for thread gages also included. Pipe thread gages include thread plug and thread ring gages for American Standard taper pipe threads, and plain plug, thread plug, plain ring and thread ring gages for Aeronautical Standard.

Circle Inform-A-Gram No. B52.

Frogally M and C Type Electrodes are covered in a new technical report from the McKay Company, 255 McKay Bldg., Pittsburgh 22, Pa. These two electrodes are specially designed for applications requiring weld metal to withstand wear under impact with minimum deformation and without spalling or cracking. Typical uses include the build-up and repair of high manganese and high carbon switch points, frogs and crossings; maintenance welding of wobblers, spindles, and other rolling mill equipment; and the welding of high carbon heat-treatable castings. A hardness versus impact chart included.

Circle Inform-A-Gram No. B53.

SAVE TIME AND MATERIALS

Oil-hardened tool steel tapered pin gages accurate to + 0.0001" − 0.0000" insure dependable sizing and location of holes and slots for machinists, set-up men, tool and die men, inspectors, all who need precise hole measurement.

CONCENTRIC TAPER on lower half of each gage fits holes 0.0012" smaller than standard letter, fraction, and number size drill holes. Makes insertion easier. Permits gaging of odd-size holes and slots.

ALL GAGES are 1½ inches long. Sets contain a pair of each size in a plastic case with 4-place decimal equivalents of each size plainly marked.

ALL ITEMS STOCKED FOR IMMEDIATE DELIVERY

THE Horberg GAGE COMPANY

29 STAPLES ST., BRIDGEPORT, CONN.

Quantity

..... Letter sets @ $45. 52 gages (A-Z)
..... Fraction Sets @ $50. 60 gages (1/64" to 1/2" in 1/64" steps)
..... Number Sets @ $90. 120 gages (1 to 60)
..... Single gages @ $ 1.
..... Stand alone @ $10.

Please Rush checked items and literature to

company.....
address.....
name.....
title.....

Carbide Tipped Metal Saw by North American Products Co., 3100 West Cherry St., Milwaukee 8, Wis., has exclusive "Magni-Sharp" carbide cutting edge. The tips are diamond ground, and inspected by a high magnification process. Tests indicate an efficient life of from 12 to 20 times that of carbide tipped blades sharpened in the conventional manner. High alloy heat-treated steel body combines with correct design to give long and profitable production life.

Circle Inform-A-Gram No. B54.

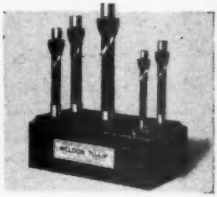
Cut-Off Saw Bands for horizontal and vertical machines are dealt with in bulletin 51-803 from the DoALL Co., Des Plaines, Ill. Technical data includes specifications on the available types of cut-off bands, lubricating and tooth "set" information for different jobs, and data on specific operations such as cutting 9½" diameter solid steel round and iron pipe. Complete ordering information for both bulk quantities and ready-to-use welded lengths is also given.

Circle Inform-A-Gram No. B55.

YESTERDAY'S PIONEER - - - TODAY'S LEADER

WELDON "TU-LIP" COUNTERBORES

For FAST, FREE CUTTING



As the name implies, WELDON "Tu-Lip" counterbores have only two cutting lips or flutes. This feature, together with the fast spiral, makes the "Tu-Lip" the fastest, freest cutting counterbore on the market.

Breakage due to clogging is prevented because this improved cutting tool provides more than ample chip room. Furnished singly in sizes desired or in convenient wood block sets as illustrated.

Weldon distributors throughout U. S. A. and Canada carry complete stocks to serve you.

WRITE FOR LATEST CATALOG NO. 10.

THE WELDON TOOL CO. Cleveland 4, Ohio

3000 WOODHILL ROAD

Press-Rite Open-Back Inclinable Power Press is described and illustrated in bulletin P-552 from the Sales Service Machine Tool Co., 2363 University Ave., St. Paul, Minn. Eight models are featured, with capacities from five to 85 tons, with detailed specifications for each. Features of the line include air-flex clutch brake system, unicast frames, triple ramway lubrication, and non-repeat single-stroke mechanism.

Circle Inform-A-Gram No. B56.

Low Cost Coolant System. A simplified, low-cost coolant pump and motor assembly, which, when immersed in a pail or other coolant container, becomes a complete coolant system, has recently been introduced by Factory Tools, Inc., 4706 W. Arthington, Chicago 44, Ill. The unit has a high volume vane type pump, and is equipped with a semi-rigid flexible metal hose with a nozzle adjustable for any desired volume of flow. Supporting legs of the unit are threaded to permit height adjustment of the pump and motor for the container and coolant level, and are angled to give stable support to the assembly.

Circle Inform-A-Gram No. B57.

Seven Types of X-Ray Equipment made by Westinghouse Electric Corporation for industrial applications are described in four page folder No. B-4787, entitled "Seven Industrial Eyes". The folder contains pictures of each type of equipment with a brief description of how each is used. The units described are: single-column tubestand unit; industrial jib crane unit; ultra high-speed radiograph unit; mobile unit; equipment for mass inspection of parts; wall mounted unit; and a thickness gauge. A post card for requesting more detailed information on any of the equipment is included.

Circle Inform-A-Gram No. B58.

New Kennametal Catalog gives a complete picture of the sizes of the carbide tools now available. In addition to the standard Kennametal brazed tools this catalog lists blanks, new "top-clamp" Kennamatic tools, Kendex tools, Kennamills, and various specialties. Profiling and railroad shop tools are among those shown for the first time. The new catalog is exceedingly well laid out, making reference easy. For your copy write Kennametal Inc., Latrobe, Pa., for catalog 52.
Circle Inform-A-Gram No. B59.

Lubrication Process for Cold Extrusion. A new phosphate coating and lubricating process, which makes possible the cold extrusion and forming of steel is fully described and illustrated in an eight page booklet now available from the Detrex Corp., Box 501, Detroit 32, Mich. The process, identified as "Extrudite", is applicable both to the carbon and stainless steels.
Circle Inform-A-Gram No. B60.

Data Sheet Gives Facts on Granite Surface Plates. The features and advantages of granite surface plates for precision measuring and gaging operatings are listed and discussed in bulletin 51-829 from the DoALL Co., Des Plaines, Ill. Features include a harder-than-glass and non-lapping surface that resists the imbedding of dust and abrasives; non-rusting and non-magnetic characteristics; and complete freedom from warpage. Numerous sizes of these plates are listed on the reverse side of the data sheet, along with prices for plates of different accuracies up to 50 millionths. Included with this information is data concerning steel stands for holding the surface plates.
Circle Inform-A-Gram No. B61.

"Phos-Copper" Brazing Alloy Available in Paste Form. This free-flowing brazing alloy from Westinghouse Electric, Box 2278, Pittsburgh 30, Pa., has a low melting point for brazing operations on copper and copper alloys. A small amount can be placed between the pieces to be joined, when the joint need only be heated until the brazing filler metal flows. The compound is designed for resistance brazing where it can be conveniently pre-placed. On most copper applications no flux is required.
Circle Inform-A-Gram No. B62.

Model 1458-A Ultra Speed Gear Hobbing Machine is featured in catalog 1458-52 from the Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. The machine will accurately hob the teeth on two 3⅛" dia. helical gears with a 1⅝" total face width in 58 seconds. The bulletin includes complete design and operating descriptions, tooling layouts for hydraulic clamping, and general machine specifications. A push-button-controlled preselective adjustable hob shifter available as extra equipment is also described.
Circle Inform-A-Gram No. B63.

AMAZING SAVINGS IN METAL CUTTING ARE MADE BY
FRICTION SAWING
with
Tannewitz HIGH SPEED BAND SAWS
The ease and speed with which these machines cut through sheets of soft or hard steel, non-ferrous metals, plastics and many other materials provides marvelous opportunity for increasing production and lowering costs. And for cutting formed parts, or trimming cuttings, there's nothing to compare with it, for the down-drag of the saw is so negligible that in most cases no jig or rest whatsoever is required. Get the complete facts, NOW!
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The TANNEWITZ WORKS
GRAND RAPIDS, MICHIGAN

Machine Tool Industry Proposals

Frederick S. Blackall, Jr., President and Treasurer of the Taft-Pierce Manufacturing Company, Woonsocket, Rhode Island, and President of the National Machine Tool Builders' Association has proposed a long-range machine program designed to serve as a sound foundation for the national economy and for stability within the industry. Speaking before the 1952 spring meeting of the Association, Mr. Blackall summarized the program as follows:

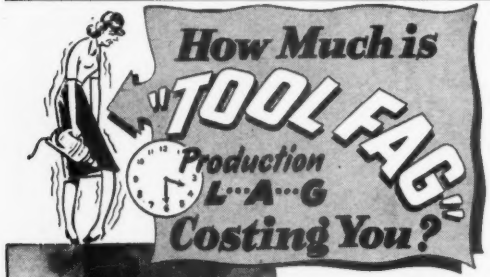
1. The federal tax laws should be modified to permit rapid and complete recovery of capital invested in industrial plant and equipment. Such a step would provide a tremendous stimulus to keeping plants equipped with up-to-the-minute machinery.

2. In renegotiation of earnings, the principle of carry-back and carry-forward should be recognized so that the machine tool industry will not find itself financially prostrated by the period of depression which follows every era of arming for national defense. Furthermore, the industry must be allowed to earn enough in periods of high production to provide adequate financial reserves against the days of subnormal activity which inevitably will follow.

3. Our Government should maintain a permanent reserve stock of machine tools, in the same manner as it now keeps tanks, guns, and small arms in reserve for the hour of need.

4. A uniform procurement policy should be adopted for all agencies of Government with respect to machine tools, to be worked out in co-operation with the industry and its distributors. Such a program would eliminate costly delays in ordering vital equipment in time of sudden emergency.

5. A complete stand-by pool order program should be adopted and checked annually so that in an emergency, the machine tool industry could swing into immediate production for defense. Pool orders should provide for financing or advance payments when needed. This M-Day Program should include provision for priorities on materials and manpower. The executive and administrative organization and procedure for a National Production Authority or a War Production Board should be established on paper in advance.



Prevent This LOSS with Mall Pneumatic Power Tools

Turn out more work, easier faster, with lightweight, vibrationless tools that reduce fatigue to an absolute maximum. Typical of Mall compactness and precision in pneumatic tools is this No. PG-K1030L Lever Throttle Die Grinder, weighing only ¾ of a pound and easily held in the palm of the hand. With a guaranteed speed of 30,000 rpm. and a maximum of .0015 runout at the collet, this Mall Pneumatic Die Grinder assures accuracy, precision and ease of operation.

Send For Complete Illustrated Bulletin With Price List.

40 Factory-Owned Warehouses, Coast To Coast, To Serve Our Customers.

Mall MALL TOOL COMPANY

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6. Our Government should call a halt to subsidizing foreign competition in the U. S. domestic machine tool market with the U. S. taxpayers' dollars.

7. A long-range public relations program should be conceived and executed over a period of several years, aimed at acquainting the Government and its citizens with the fact that a strong machine tool industry is essential to the maintenance of a strong nation.

8. We should work for the establishment of a Permanent Machine Tool Commission, co-operate with it, and if possible enlist its support of our general program.

"Prerequisite to a sound defense program," Blackall said, "is a machine tool industry, maintained at such a level of preparedness that it will be ready at the drop of a hat to swing into round-the-clock capacity operation. In a sense, this industry should be regarded as a fifth branch of the Amed Forces. Happily there seems to be a growing awareness in high Government circles of the strategic character of machine tools as the central core of our military security and our civil prosperity."

★ ★ ★

Bay State Promotes Four

The following promotions from the home office Sales Engineering Staff to Abrasive Engineers were announced recently by E. Halsey, Brister, Sales Manager, Bay State Abrasive Products Co., Westboro, Mass.

John R. Boudreau to Dallas, Texas (Clark University graduate)

Robert A. Green to Detroit, Mich. (Worcester Polytechnic Institute graduate)

Russell L. King to Chicago, Ill. (Worcester Polytechnic Institute graduate)

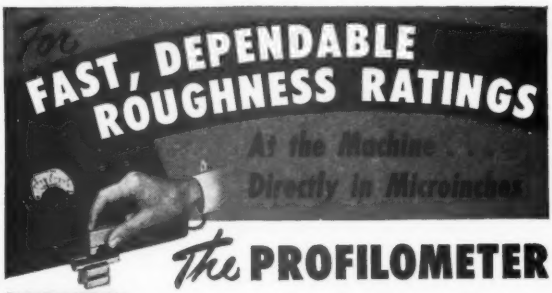
John R. Mele to Toledo, Ohio (Cornell University graduate)

News From The N.T.D.M.A.

New orders, less cancellations received by contract tool and die shops for special dies, jigs, fixtures, etc., have increased 7% over the previous month according to the July survey by the National Tool & Die Manufacturers Association.

For the month of May, deliveries of products of the contract tool and die shops, vital to the mass production of civil and military goods, were 122% of last year.

Further, the NTDMA survey also revealed that backlogs continued to rise, registering a gain of 3% over the previous month.



The PROFILOMETER

√FAST The Profilometer is the fastest of all means for obtaining surface roughness ratings. Simply move the Tracer along the work and read the microinch meter.

√DEPENDABLE Always gives the same roughness reading for any given path of trace—in definite microinch units—no matter who is using it.

√VERSATILE Measures 98% of all machined, ground and finished surfaces, internal and external—straight, tapered and circular—including narrow slots, deep holes, recessed shoulders.

√PRACTICAL Designed and built for shop use, *at the machine*. Requires no special skill or knowledge. Frees skilled workers for other work.

FREE BULLETINS L6 and L11 give full details. *Write for them*—and arrange for a Profilometer demonstration in your plant.

Profilometer is a registered trade name.

MICROMETRICAL MANUFACTURING CO.
FORMERLY PHYSICISTS RESEARCH COMPANY
345 S. MAIN ST. ANN ARBOR 15, MICHIGAN

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR KEY NUMBERS

. . . Diamond Salvage, from page 106

action of the wheel, careless and unnecessary dressing wastes diamonds.

Five Important Don'ts:

Don't let an untrained employee dress or use a diamond wheel.

Don't use diamond wheels for rough grinding when silicon-carbide wheels will provide adequate service.

Don't use diamond wheels for grinding steel portions of carbide tools.

Don't grind dry with metal- and vitrified-bonded diamond wheels.

Don't force wheels into the work or work into the wheels to make them cut faster, for this reduces efficiency and wears down wheels unnecessarily.

Swarf and sludge are valuable sources of salvage. Diamonds lost during operation of grinding wheels either crack up or shatter in use, or are pulled from the bond which holds them in place, and can be reclaimed for reuse.

Wet grinding should be used whenever the application permits, for greater percentage of diamonds is saved in wet grinding than in dry grinding.

To salvage the maximum amount of bort during wet-grinding operations:

1. Save sludge from diamond wheels.
2. Add a settling tank to the wetgrinding machine to prevent runoff of diamond particles.
3. Collect sludge from diamond wheels separate from sludge of other abrasive wheels.

To lengthen the life of the wheel in dry grinding, a mist coolant or wick should be applied whenever possible. For swarf recovery:

1. Use converted vacuum cleaners with disposable paper bags.
2. Use disposable vacuum-cleaner paper bags placed in the exhaust system connected to the grinding machine.
3. Use commercial dust collection units connected to the grinding machine.

Diamonds mounted in tools, wheel dressers, drilling bits, wire drawing dies, glass-cutting tools, and other diamond-containing products are never completely worn out.

To get maximum use from them:

1. Explain to operators the program and the need for proper tool handling.
2. Instruct operators in the proper handling of tools.
3. Collect diamonds for salvage, sale, and reuse through regular trade channels.

All who have contact with diamonds in any form must cooperate if our vital needs are to be met. This includes manufacturers and consumers of industrial diamond products, representatives of the carbide tool industry, diamond wheel and tool manufacturers, industrial diamond reclaimers, manufacturers' and distributors' sales representatives, diamond grinding wheel operators, and anyone else who handles diamond-containing tools. Only with the coordinated effort of all of these can the accelerated production be met.

Engine and Tool Room Lathe Standards

More than superficial checking is necessary to maintain the high degree of accuracy required of today's lathes, which have been engineered with great care and built to exacting limits, says J. H. Myers, Vice-President of the Lodge and Shipley Company, in the July issue of **STANDARDIZATION.** That is why standards of accuracy for engine lathes and toolroom lathes have recently been developed and approved as American Standard. The user can now check his lathe from time to time against minimum standards of accuracy and alignment.

The National Machine Tool Builders' Association, co-sponsor of the sectional committee on Small Tools and Machine Tool Elements, B5, which processed the standard, prepared the new standard after an intensive study of existing Eureopean standards and individual standards used in this country. The Lathe Group of the NMTBA uses the standard in the final testing of their product before shipment. Other sponsors of ASA committee B5 are: Society of Automotive Engineers, Metal Cutting Tool Institute, and the American Society of Mechanical Engineers. The latter organization published the standard.

Every phase in the testing of the lathe has been covered in the new guide. It provides a set of tolerances for 12-in. to 18-in., 20-in. to 32-in., and 40-in. to 72-in lathes. A 36-in. size, included in an earlier American Defense Emergency Standard adopted during the war, has been dropped by all makers since publication of the earlier edition and has not been included in the 1952 standard.

"THE ORIGINAL"
MAUSER PRECISION VERNIER CALIPER
$14.75 PPD

NEW EXCLUSIVE CAMLOCK AND GIB IMPROVEMENT INSTANTLY FIXES SETTING, PREVENTS SHIFTING, GUARANTEES SQUARENESS OF JAWS.
THE MAUSER TRADEMARK.. IS YOUR PROTECTION.
MONEY BACK GUARANTEE
FOR MEASURING INSIDE, OUTSIDE, AND DEPTH.
3 GRADUATIONS
1/1000" — 1/128"
1/10 mm. IN BACK
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DANFORTH DIAMOND POWDER

DIAMOND POWDER
Sieve and Micron Sizes
Closely graded and Purified
Complete Powder Reclaiming Services for Sludges, Used wheels, Lapping Cotton
Write for Prospectus
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Patent Pending
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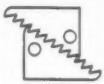
DANFORTH DIAMOND POWDER

REID SET-UP AIDS



STEP SET-UP BLOCKS
Hardened Steel or Maple

MAGNETIC BLOCKS AND PARALLELS

PYRAMID SET-UP BLOCKS

T-SLOT BOLTS

Also hand wheels, machine handles, levers, cranks, plastic balls, cast iron knobs, machine vises
Write for catalog and prices on complete Reid line
REID TOOL SUPPLY CO.
709 Baker St. Muskegon Hts., Mich.

Victor's Specials Deserve Your Attention!

High Speed Drills ... *EXTRA LONG LENGTH*

Straight Shank No. 1-60

No. By Gage	Length Inches	Our Price Net Each
1 to 10	6¼	$1.00
11 to 20	5¾	.90
21 to 30	5⅜	.80
31 to 40	5¼	.70
41 to 50	4½	.60
51 to 60	3½	.50

Straight Shank

Size Inches	Length Overall Inches	Length Flute Inches	Price Each Net
1/8	12	9	$1.65
9/64	12	9	1.65
5/32	12	9	1.65
11/64	12	9	1.65
3/16	12	9	1.65
13/64	12	9	1.80
7/32	12	9	1.80
15/64	12	9	1.95
1/4	12	9	1.95
17/64	12	9	2.05
9/32	12	9	2.05

Size Inches	Length Overall Inches	Length Flute Inches	Price Each Net
19/64	12	9	$2.25
5/16	12	9	2.25
21/64	12	9	2.50
11/32	12	9	2.50
23/64	12	9	2.75
3/8	12	9	2.75
25/64	12	9	3.05
13/32	12	9	3.05
27/64	12	9	3.30
7/16	12	9	3.30
29/64	12	9	3.60
15/32	12	9	3.60
31/64	12	9	3.60
1/2	12	9	3.60

IMMEDIATE DELIVERY

VICTOR MACHINERY EXCHANGE, INC.
DEALERS IN TOOL ROOM EQUIPMENT
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SEE ADVERTISERS INDEX, BACK OF BOOK, FOR KEY NUMBERS

. . . **Pressed Metal Institute, from page 77**

using it. Do they buy their punches and setups from you thereafter? If so, how long does it take to get them?"

Answer: "All parts are ground, to begin with. Punches and bushings are held on the shank and in your holders to approximately .0002. I mean that. I am not using that carelessly.

"You are not completely trapped. True, we have got to maintain prices in which you can buy the retainers and component parts, punches, bushings, strippings, and that sort of thing from us cheaper than you can make them or have them made. You can have them made. Generally speaking, it is cheaper to buy them from us, because we make them on a very large production scale. I won't say that on any type of adjustment two weeks from today you are completely trapped, unless it might be possible that somebody has a policy to that effect. If so, I don't know about it."

Question: "On an in-line percentage, where you have multiple punches and you have to chart even, say, one bushing quite often, how do you compensate for bevel on that?"

Answer: "If the centers are not too close together, it makes very little difference. Generally, on a spring stripper, the bottom plate or what we call the punch end plate, is rounded a little bit on the ends. If you are on about 1-¼ centers, or maybe ⅞, in case of ⅜ bore or smaller, and you had a variation of as much as $\frac{1}{16}$ of an inch, you would get markings. There is no question about it. On the other hand, the punches and bushings are removable right in the press, and it only takes a moment. A few extra punches generally would take care of that."

Question: "Is there no possibility of shimming, like you can do on the conventional die?"

Answer: "Yes, you can shim, but with the method by which the punches and bushings are held in, you probably know there is a pocket there, and the holding screw is at a given angle, so that when you do shim you change that angle. You do not get a very good grip on it."

Question: "How close can you punch the holes?"

Answer: "Any hole up to ½ inch can be put as close as 1½ inches, on what we call the magnetic series or on our adjustable 500 series unit. That means ½ inch and larger. Those go up to 3 inches. On the ⅜, 16 gauge they may go as

Severance DEBURRING CUTTERS HIGH SPEED CARBIDE

Unexcelled for power and hand deburring
Sectional pattern teeth give shearing action

Severance INSIDE DEBURRING CUTTERS
GROUND from the solid
Select 45° High Speed cutters from 28 standard sizes and 30° cutters from 35 sizes—from ¼" to 3" diameters.
45° 30°
Both angles can be supplied in CARBIDE

Severance OUTSIDE DEBURRING CUTTERS
GROUND from the solid
For speedy light deburring of rod ends and tubing O.D's., either offhand or in screw machines. Select 30° cutters from 14 standard sizes and 45° cutters from 10 sizes—up to 4 inch diameter.
ANGLES 30° & 45° C/L
Both angles can be supplied in CARBIDE

OUTSIDE CHAMFERING MILLS
Operate in machines to perform heavy chamfering without chatter —in above size range and angles.

HEADQUARTERS FOR DEBURRING AND CHAMFERING TOOLS DEVOID OF CHATTER

Severance HAND DEBURRING CUTTERS
"A Twist of the wrist" easily bites off the burr left by drill or punch.
Ten standard sizes for ⅛ to 2" diameters.
Write for Bulletin 16-D

Complete REGRINDING Service — by New Tool Craftsmen — Savings are thus multiplied —
Write for Catalog

Severance Tool Industries, Inc.
730 IOWA AVENUE SAGINAW, MICHIGAN

MIDGET MILL GROUP
MIDGET MILLS
¼" Shanks
ARBOR MILLS
½" Shanks
LAB MILLS
⅜" Shanks

TUBING GROUP
STANDARD Chamfering
SOLID (For Endless Life)

COUNTERSINK GROUP
STANDARD
HEAVY DUTY
BALL SEAT REAMER

close as ⅞ of an inch. We also have available in the larger units some special units which will punch holes ⅜ and go as close as ⅞ center.

"In the larger range of equipment going up to ¼ inch thick, the closest standard arrangement is 1-¼ center to center. We have a special unit which, if the hole does not exceed ⅜ diameter, can be got as close as ⅞."

Question: "On what are these adjustable dies run, press brakes or regular presses?"

Answer: "That is a very interesting question. Ten years ago my records show that in the Midwest here—and that covers some seven or eight states—nine sales out of ten were going to presses. Today nine sales out of ten are going into press brakes."

Question: "Is there any reason for that?"

Answer: "Well, I think the reason for that is the fact that in the use of adjustable dies you cannot get as many holes in a given area as you can get with the conventional die, and demand for low-cost tooling has made it necessary to try to produce the part, with the least number of hits, from the time it is picked up, and before it is replaced on the skid.

"The tendency has been toward larger presses, such as crane type press or press brakes. Labor I think is the angle that has caused it. If you are going to produce a part that requires five or six operations, it is cheaper, if your production warrants it, to tool up to hit it in four, five or six stations and then drop it, than to pick it up, strike it, put it down, and repeat in the several set ups.

"I know that is so, because many of the very large companies are putting their production on that basis.

"When I speak of the use of press brakes for the purpose, it is because of the face that I think you can actually use them in a number of ways. In other words, most jobs we work on require bending or braking, one way or the other, and it is probably simpler to have the brake available for that purpose. Generally the ram angles or brackets are removable."

Question: "You mentioned the Wiedemann Company. That is a little different process than your Whistler process. Could you tell us a little about that, for the benefit of covering the field?

Answer: "Well, I can only tell you what I have seen. I think that the Wiedemann people have made some very defi-

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nite advancements in that respect. I find that they have an electric system at the present time that has speeded up their production considerably. It is my impression that on special parts, particularly larger pieces, and possibly up to runs of 50 duplicate parts, they have served a very good purpose, and they can handle some good-size stampings."

Question: "Do you feel that for the general line of electronic chassis work now, your Whistler equipment can compete with Wiedemann's? Do you feel that the Wiedemann press usually can make the part cheaper, say, in quantities of 50 to 500 pieces?"

Answer: "Honestly, I don't know. I think you would have to weigh the first cost, to begin with. I think that would be the determining factor. I will tell you this, that we put equipment in many, many large plants, and it works right alongside of Wiedemann equipment. I think that they have their place, just as I said in the beginning, that the word "short runs" is a sort of misnomer as far as we are concerned. The tendency has been to create what we call short run dies, but we find that they become permanent dies.

"I think, again, that you must tailor it to fit the job. I couldn't take a position on that. They are both useful pieces of equipment."

Question: "Can we agree on a definition of short runs?"

Answer: "Let's say that the definition of a short run is as has been explained—it varies from requirement to requirement and from shop to shop. In some plants, 10,000 to 20,000 pieces might be a short run and, on the other hand, certainly one piece would be a short run, no matter where it was made."

Mr. Rumbarger commented: "I might say this, along the same line on short runs. I was in one of our larger plants in Cleveland and they took me into the time study department and gave me some prints to look over, and said, "You know, we would like to use your equipment on this, because this is all short-run stuff."

I said, "Is that so?"

"Yes."

"What is your production?"

"We make 15,000 a run."

Quarterly, they make such a short run.

Bending Brakes

Mr. Kilham took up the subject of bending on press brakes.

"Years ago, in the early part of the last war, I had a very nice time in New

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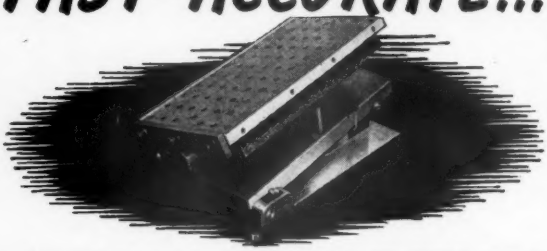

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Mexico, in charge of a group of Navaho Indians, making all kinds of ornamental pieces, and a few pieces for oil well equipment. That was all short run, seldom more than one of anything.

"In other words, to take care of those, we built the small bending brake, the ordinary bending brake with big pins at each end of the bed, so that a piece could not be pulled through. The blade that came down was held at each end, which prevented us getting around it. This made it awkward, so we built a small bending brake, with the blade completely free at each end, but held in the middle. Then we put on a roller to blend the metal, instead of the usual sharp edge. The roll was supported from underneath.

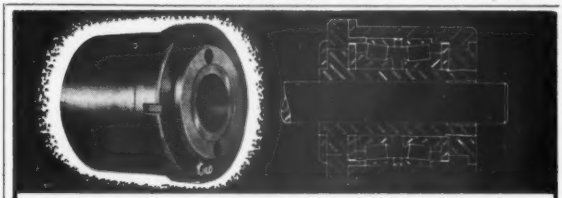
"Then we took this brake to a few aircraft companies and others, and found everyone seemed to have some particular headache. A number of companies took this brake for short-run production. We found that the main thing that was holding up production was that there would be one bend in the piece that they couldn't get, or one kind of material that they had endless trouble with. That would lead them perhaps to go to castings, or some other method of doing the work, taking the metal work right away from the pressed metal people.

"Strangely enough, just the other day I was working on a problem for a company where they had some little arrows to make. They were going to cast arrows because they were horrified at the thought of having a press. They thought the die would be so high in cost.

"In the space of about an hour, I made them a little arrow, and they were so pleased with the pressed metal arrow that they decided to change from castings and go to metal press. Now they find they need several thousand arrows, and instead of bending it on our machine, they are going to have a die made and do it in the usual form.

"In another case, a company in Connecticut had a trial order for 1000 waste baskets that had a rim around the top. They couldn't possibly afford to buy the equipment to make those rims in the usual way. We made them a little test on our machine, so that the cost of the machine was written off in making the sample order of 1000. The order beyond that was to cover dies for the work.

"The concern that would still develop this is the International Silver Company, which has some ornamental rims, dam-



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aged by ordinary dies. Our work conforms with the rollers, so it is smooth. That is a particular job that can be used in the press.

"I think that in the greater part, the sales of our machine, which we thought would be for short runs, have just gotten people going in the direction of stampings, and press parts, and I think it has sold more jobs for presses than it has for itself."

The folks in Connecticut found that with it they could make a sample in a few hours for the customer company and show them the finished article. They can make a variety of bends on our machine, which the press brake will do, but they need no fancy dies to start with. They use it for a selling proposition.

"It has been a fascinating study for me to go to these different companies and find out what their problems are and to work them out. They find that in most cases they have a picture on paper of what they want in their drawings, but it is hard for them to visualize the finished item, formed on the press or stand. If you can make an extra sample, that they can see, it is much easier for the customer, and it is much easier for the person designing the tools. It is something concrete to look at and judge by.

"I find that particularly all of our machines have been bought to eliminate some special difficulty. We may find that a person has five bends to make, and thinks he can make four in the present equipment, but can't make the last one. That last one might be the headache of the whole job, even though it is one-fifth the bends. It might have taken half the production time, because it is extremely difficult.

"Another advantage over the normal press brake is that you haven't the metal held on either side, whereas, with our machine you have it clamped tight at one side. On the radio chassis we bend 3/32 aluminum, with a lip ⅛ inch high. Before that, they had a high lip, and then trimmed it, which naturally was very expensive

"Another case was that of an aircraft company. It has a welded piece, a piece that should be done on the press brake, but the material thickness was not constant, and the hardness was not constant. So the press brake wouldn't bend it at the right point. It would bend somewhere else. I though of holding it firmly on one side, and bending it just where it should be."

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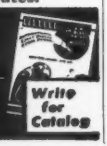

Speaker was interrupted: "Just one moment. Just how does this compare not compare in performance, but how does it fit into the field as compared to a Di-Acro setup? Could you explain that?"

"The Di-Acro has the blade held on each end, so you can't get around it. It doesn't bend with the roll. In drawing with the roller you can use almost any material thickness, from .010 to ¼ inch. You can use round or flat stock with the same setup. To be sure, with the roller you don't get the sharp radius on the inside, but fortunately for us, the government doesn't like sharp radii. They like a little curve. This gives a radius."

Questions and Answers

Question: "Considering that machine from the sampling angle, what is the smallest radii?"

Answer: "It depends on the thickness of the stock."

Question: "I realize that. Could you dovetail an end on either end, so you could change radii?"

Answer: "You change the whole blade."

Question: "Change the whole blade?"

Answer: "There are three screws holding the blade. You can make your own out of cold rolled steel."

Question: "What is the price of that machine?"

Answer: "$398."

Question: "What is the maximum length you can brake on that machine?"

Answer: "The actual length is 15 inches. Many are larger, but it happens that the size of the demonstrating machine is about as large as can be operated conveniently by foot power."

To be continued

American Distributor Appointed For European Heavy Machine Tools

Europe's largest builder of heavy machine tools, Schiess A. G., Duesseldorf, Germany has appointed Kurt Orban, Inc., exclusive American distributor.

Large Schiess equipment such as vertical boring mills up to 84 ft. turning diameter, vertical turret lathes up to 71 in. diameter, and horizontal boring and milling machines up to 12⅝ in. spindle diameter, will be exported to the United States for the first time in the company's 72 year history. Gear hobbers, crankshaft turning machines, and locomotive tire lathes will also be available in this country.

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Dollar Wisdom of Keeping Compressed Air Lines Tight

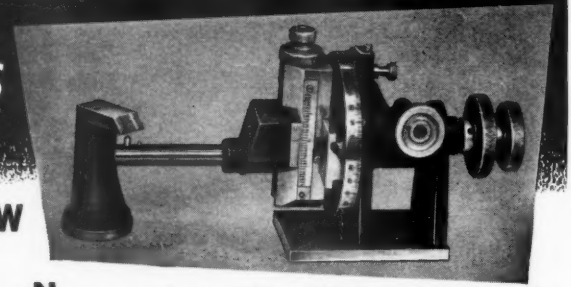
Maximum benefits are being obtained by those compressed air users who keep a close vigilance over their air systems. Conversely, where reasonable maintenance is not conducted, a loss in production and dollars is experienced. One of the greatest production robbers is low pressure.

It has been found that if the pressure at a pneumatic tool falls from 90 psig. to 70 psig., production output of that tool may drop as much as 35 percent. Somewhat more specific is the case of the air motors which are used extensively to power air tools and devices. Air motors offer more horsepower per unit weight than other comparable power sources. Because compressed air systems in most plants utilize pressures between 90 to 110 psig., air motors are designed to operate within those working pressures. An air motor, built to operate at 90 psig, however, will lose 25 per cent of its capacity if line losses in delivering air drop the pressure to 70 psig.

First inclination when air pressures drop may be to place the blame on insufficient compressor capacity. A check of the air distribution system, first, may save the cost of new compressor equipment.

One of the principal causes of low-air pressure are leaks in the distribution system. Checking the air distribution system for leaks is a relatively simple matter. Results have proved that the most likely location of small leaks are around valve stems, hose connections, unions, drains, home-made blow guns, and lines leading to inoperative tools. Of course, the entire system should be checked

Set Up Angle-Tangent-to-Radius Forms IN MINUTES with the NEW



Now you can have precision within "tenths" and set up in *one-fourth* the time. Tangi-Matic has a direct-reading micrometer *built in*, eliminating "mikes", height gages, Jo Blocks *and errors*. Even novice operators obtain extreme accuracy. Tangi-Matic dresses any concave radius down to .032", full 180° with equipment we give you. Set-ups can now be made without removing dresser from your grinder chuck.

Our new model has *removable dressing arm*, permitting the use of extensions for dressing *large wheels*. Wearing surfaces are hardened, ground and lapped to a mirror finish, assuring you of years of extra service over ordinary dressers. Lead screw is hardened and ground to extreme tolerances. Furnished complete with master setting block, small radius attachment, plastic hood and carrying case. Write for literature and name of representative in your area.

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with particular attention to the above and to lines which are subjected to unusually rugged treatment. Inspection should be made monthly.

Plant maintenance departments have come up with many simple and rather unique ways to check leaks. Most frequently used are the lighted candle or the solution of soapy water which is brushed around suspected areas. One manufacturer puts essence of peppermint into the air system. Detection of the slightest leak is by odor. Still another method, rather ingenious, is the use of what heretofore may have been considered nothing more than a youngster's toy. A small siren-like whistle, activated by air flow, is passed over the lines, a siren noise indicating a leak. Regardless of what method is adopted, when leaks are found, patch them immediately.

Some of the leaks may be very small, appearing trivial in themselves. But such leaks may be numerous and have a high accumulative effect. Actually, these leaks spell a very definite dollar loss as shown in Table I. This dollar and cents wastage more than justifies scheduled maintenance of air distribution systems.

TABLE I — COST OF AIR LINE LEAKS

Size of Opening (Inches)	Air Lost (cu. ft. per month at 100 psig. based on nozzle coefficient of 0.65)	Cost of Air Lost ($0.07 per 1000 cu. ft.)
3/8	6,671,890	467.03
1/4	2,920,840	204.46
1/8	740,210	51.81
1/16	182,272	12.75
1/32	45,508	3.19

Courtesy Steel Cooperage Division of the Serrick Corp.

The versatility of De-Sta-Co Toggle Clamps is demonstrated by this unique welding fixture designed by the Steel Cooperage Division of the Serrick Corp. The fixture holds four rectangular and three round manifold flanges to an alignment plate during the inert arc welding operation. "V" type prongs replace one jaw on three of the 12 Model #468 portable clamps to give additional gripping area. The quick, positive holding pressure of the clamps cuts set-up time to a minimum and permits precise alignment of the manifold flanges. Rapid toggle action, sure holding pressure, ease of work removal and rugged durability make De-Sta-Co portable clamps the logical choice for this production application.

There's a De-Sta-Co Toggle Clamp engineered for your work holding problems in assembly, welding, bonding, machining or inspection of any material. Select from over 40 fixture and portable models. Positive holding pressures up to 4000 pounds. Write today for a copy of the De-Sta-Co catalog describing available stationary and portable toggle clamps.

DESTACO DETROIT STAMPING COMPANY

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News from the National Safety Council

The 40th National Safety Congress and Exposition will be held from October 20th to 24th in Chicago. Sessions on industrial safety are scheduled for the Conrad Hilton, Congress and Sheraton and Morrison hotels. The traffic safety sessions will be held at the Congress hotel; the commercial vehicle, transit, and farm safety sessions at the LaSalle hotel, while the school safety sessions will be held at the Morrison hotel, and the home safety sessions at the Conrad Hilton Hotel. Further information about the schedule and proposed activities may be obtained by writing Mr. R. L. Forney, general secretary, National Safety Council, 425 North Michigan Ave., Chicago 11, Illinois.

Plant safety men in search of a lively approach to accident prevention will be interested in four recent additions to the National Safety Council's series of job training booklets. These attractive booklets are bound to shirt-pocket size, and are designed for general distribution to the industrial worker.

"Steps to Safety" presents a check list of sound safety rules stressing topics of general interest. Materials handling, protective clothing, machinery guards, fire-prevention and housekeeping are included. Detailed information on protective clothing and equipment can be found in "It Pays To Dress Well."

A jaunty sailor gives a nautical air to "Ship Shape", which extolls the advantages of good housekeeping. "Down Time" warns the worker that he must show his body the same consideration as he does his machine if he wishes to avoid the high cost of human "down time". Periodic check-ups and attention to danger signs pays off in continued time on the job.

These four 16-page booklets are printed in color and illustrated with cartoons. They can be purchased by National Safety Council members for 3¢ each in large quantities. Prices to non-members are double. Sample copies will be sent on request.

One of the Council's latest releases begins—"You could work five days a week for the next million years and not make up the time lost as a result of 1951's work accidents!" But according to "Accident Facts", which is the National Safety Council's statistical annual, these 280,000,000 man-days of lost labor represent only one aspect of the economic loss from work accidents to our nation. Just off the press, the 1952 edition points out that the total cost in dollars of occupational injuries in 1951 reached the staggering figure of $2,650,000,000.

There are many ways to cut accident costs. However it is impossible to arrive at a formulated program unless accident sources are clearly un-

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derstood. No one would try to build a Brooklyn Bridge with material but without knowledge. Yet many safety programs are built on just such a basis. A great deal of money is spent on the materials of safety, but little or no thought given to their proper application.

Twenty-one pages of "Accident Facts" are devoted exclusively to occupational accidents, providing the factual background necessary to give an industrial safety program direction and success. Commonest sources of injury, parts of the body most frequently injured, off-the-job problems, women in industry and many other subjects are included.

In addition to the occupational section, detailed statistical information is provided on accidents of all types—motor vehicle, transportation, home, farm and school. Single copies of the book may be obtained from the Council at the Chicago address at 75¢ each.

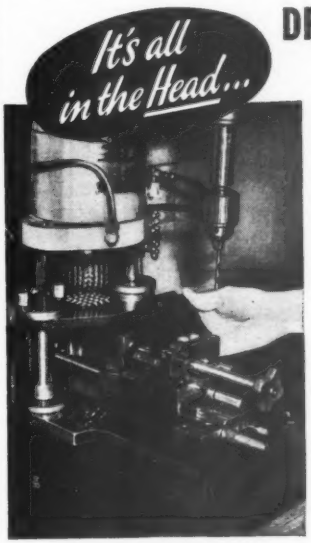
Diamond Tool Research Co., Inc. has emerged as an important new producer of Diamond Wheels. This company has been in business since 1940, and began making resinoid bonded wheels in 1949.

Its parent company, America's largest diamond cutters, provided important backing in diamond supply and an intimate knowledge of diamond technology. Beginning with one press and one mold, DTR added technicians, equipment and tools until a high rate of deliveries was attained. The present wheel catalog of eight pages is to be succeeded shortly by one three times the size, copies of which will soon be sent out to all customers.

Important new developments in bonds are impending and will soon be announced. With the release of the new catalog the company will be in a position to supply sixteen types of diamond wheels in a range of diameters from ⅛" to 8" in a complete range of grits, diamond depths and concentrations. Company production is constantly increasing, and bulk orders for wheels are filled on a four to five month delivery schedule.

New Service Facilities For West Coast Industry.

TOCCO Announces New Offices. The TOCCO division of the Ohio Crankshaft Company, Cleveland, has announced the opening of a west coast office at 3349 Union Pacific Ave., Los Angeles 23, California, to make available complete service facilities to west coast industry. The company's Chicago office has moved to much larger quarters at 6600 South Nashville Avenue. In addition to the regular sales engineering and service personnel there is a new laboratory completely equipped for experimental work on Induction Heating applications. Mr. L. C. Schweitzer, TOCCO's Chicago district manager for many years, is in charge of the enlarged operation.



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Zagar TOOLS FOR INDUSTRY and SPECIAL MACHINERY

. . . Cold Forming, from page 102
as seams, splits, and slivers, either centerless ground or cold drawn stock is frequently employed.

The more frequent compositions that are employed in cold heading are the stainless types 302, 410 and 430; the latter analysis being the preferred since it is most easily formed. The choice of composition between types 302 and 430 is purely a matter of corrosion resistance when both analysis can be applied for the same job; type 302 having a greater resistance to corrosion and oxidation. At times, the color differences between these two type analysis may also be a deciding factor in choice. Equipment requirements in the heading of the austenitic stainless should include greater heading power and rigid alignment; the energy increase over that required in the heading of the low carbon steels being approximately 40 percent. This factor can also be visualized by the lower tool life usually experienced and the difficulty experienced in filling out difficult head shapes and the production of sharp corners.

Equipment, Tools and Lubricants

The choice of press equipment is dependent to some extent upon the specific operation that is involved; thus where shock is encountered in such operations as blanking and punching, the mechanical press is the preferred. The choice of press equipment within this category is varied; thus the open back, the inclinable, the permanently inclined, the 'C' or open throat vertical cap type, or the narrow, single point suspension, straight side type of frame can be employed in the blanking of small to medium parts. For larger work, the higher capacity presses of the 'C' frame or open throat vertical and the permanently inclined press type can be employed. One advantage of the permanently inclined press, the incline being seldom more than 23 degrees, is that the blanked parts may fall by gravity into a tote box situated in the back of the press. This time saving feature along with the fact that the degree of incline does not usually complicate the die setting, is increasing the popularity of this type of press.

Press operations involving forming or drawing can be performed on either a mechanical or hydraulic press, the latter being usually the preferred. Those factors that would influence the choice of a hydraulic press can be enumerated, thus: (1) considerable more power is available than realized in a mechanical press of similar size; (2) the drawing speeds are usually slower, favoring greater reduction per draw, this being especially true of the austenitic stainless; (3) the hydraulic press is more readily adjusted for thickness variations. On the deficit side, hydraulic presses can develop series oil leakage and are usually more difficult to maintain than the mechanical press. In addition, initial costs are usually greater.

Other equipment, which are usually standardized in accordance to design, capacities, etc. include the spinning lathe where a multitude of operations can be performed besides actual spinning, roll forming machinery, power brakes, power benders, stretch formers, gang slitters, etc.

The choice of tool materials will be dependent upon the design of the operation to be performed, the quantity of parts of identical design required, the nature of the operation, the material formed, etc. Thus, in drawing operations, various cast iron compositions can be used where production quantities are limited. In the same sense, the high carbon steels are used for short production runs in shearing, blanking, punching and perforating operations, whereas for circular slitting cutters, alloy steels containing 1.0 to 1.3 percent tungsten and small percentages of either chromium or vanadium are frequently used. In any of these applications where medium to long production runs are expected, a higher quality alloy composition is usually selected. Thus, in deep drawing, the high carbon-high chromium composition steels have proven successful. Also, the high speed steels and those compositions which lend themselves to nitriding can also be employed. In the latter instance, the composition chosen for nitriding should have a sufficient core hardness after nitriding is completed since the high pressures encountered in drawing may cause the case to fail if the core strength is not sufficiently high. Carbides are used to some extent in deep drawing; this being either in the form of a solid carbide die or by the use of inserts at those points where wear is

(Continued on page 190)

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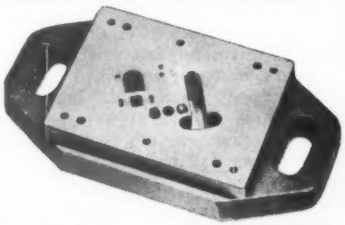

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Testing a Wax-Type Cutting Oil

To determine the efficiency of a new wax-type cutting oil, one hundred different cutting fluids were tested at the Engineering Research Institute of the University of Michigan. This exacting testing project was under the direction of Dr. Orlan W. Boston.

Among the tests carried on was the lathe force test to determine the degree of force required to push and part different metals. A wire-resistance strain-gauge dynamometer with a Brush strain analyzer and a Sandborn analyzer were used to record on a graph the two components of force. Cutting forces were reduced by as much as 36% and feeding forces by as much as 15% by the use of various cutting fluids.

In a tapping test, a Esterline Angus recording wattmeter was used to measure the amount of power consumed in tapping ½ x 13 threads in S. A. E. steel. Wax cutting fluids showed lower power requirements than carbon tetrachloride in this test using various cutting fluids.

The tests showed that certain waxes in combination with other materials have excellent lubricating qualities, providing a cooler cutting action which contributes to longer tool life, permitting increased feeds and speeds and improving the finish of machined surfaces.

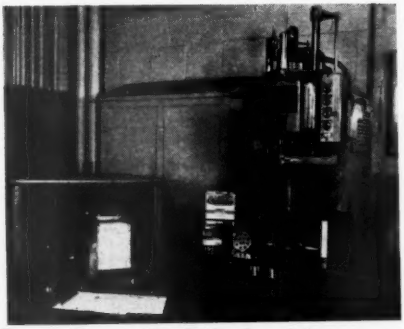

Fig. 2. Wax cutting fluids showed lower power requirements than carbon tetrachloride in a test of various cutting fluids. The Esterline Angus recording wattmeter (above) measured the amount of power consumed in tapping ½ x 13 threads in SAE 1018 steel.

Tests showed a reduction of heat when using this new wax-type cutting oil. This means less smoking and wasteful loss of cutting fluids through burning and atomization.

The new product is free of all chemically active additives such as chlorine and

(Continued on page 184)

Fig. 1. Lathe force tests using different lubricants were made by the University of Michigan Engineering Research Institute during the development of a new wax-type cutting oil. The technician, (left) is conducting a test for the detemined degree of force required to push into and part different metals. He is using a wire-resistance strain-gauge dynamometer with a Brush strain analyzer and a Sandborn strain analyzer to record on a graph the two components of force. Cutting forces were reduced by as much as 36 per cent and feeding forces by as much as 15 per cent by the use of various cutting fluids.

Photos Courtesy
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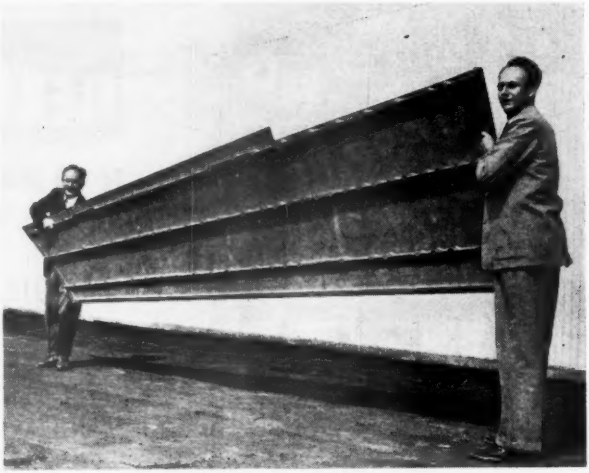

Fig. 1. This 16-foot airplane wing section was cast in a single piece from featherweight magnesium. Northrop Aircraft, Inc., with the assistance and co-operation of the Aluminum Company of America, produced this sample wing section as part of a research project sponsored by the U. S. Air Force. Believed to be the largest cast aircraft surface ever produced, the casting marks substantial progress in a program to cast airplane wings from magnesium. Unusual significance is attached to the wing casting project since it promises substantial benefits to the nation's defense production program. It is believed that cast wings can be produced much more rapidly and economically than can conventional aircraft wings.

Fig. 2. Casting of aircraft surfaces, such as wings, is particularly difficult since tolerances and strength weight requirements are so exacting. Considering its size, the wing section casting is extremely thin. In places it is only ¼″ thick.

The techniques used in successfully producing the sample casting were evolved through extensive experimentation and development of numerous innovations in standard casting procedures. The casting methods have not been disclosed. Since this is an experimental casting, the impression should not be created that the time has arrived when airplane wings can be cast in quantity because additional experimentation and testing must still be performed.

★ ★ ★

Tooling Backlog

The backlog of unfilled orders for tools, dies, jigs, fixtures, molds, gages and special machines produced by contract tool and die shops has increased in the second quarter of 1952, a survey by the National Tool & Die Manufacturers Association has revealed. This increase resumes the upward trend in backlog begun in early 1950, which was interrupted by a decline during the first quarter of 1952 as a result of cancellations.

Deliveries of the products of contract tool and die shops for the year to date was 154% of last year's.

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Will Efficiently Handle "101 TRICKY" Second Operation Jobs on SMALL PARTS ordinarily requiring larger, expensive milling machines

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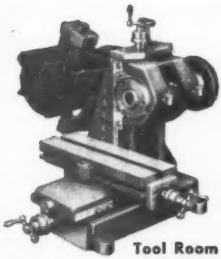

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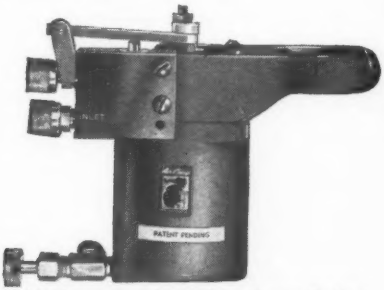

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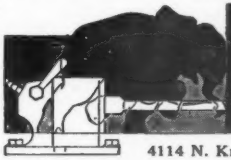

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SEE ADVERTISERS INDEX, BACK OF BOOK, FOR KEY NUMBERS

Circle postage-free Inform-A-Gram Key Number for your request

New Brochure "Diamond Tool Engineering" from Maurice S. Dessau Co. Inc., Bank of Manhattan Bldg., 535 Fifth Ave., New York 17, N. Y., is of great interest to anyone connected with the purchase or use of diamond tools. It

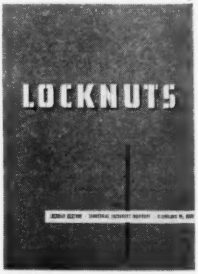
contains innumerable time-saving suggestions that stimulate the production of speedy, top-quality work. Among the many subjects given detailed coverage are the selection of size, shape, and quality of diamond tools for a given job; feeds and speeds; wheel and thread work; correct adjustments; coolants, care and handling of the tools; and an interesting section on high speed techniques.
Circle Inform-A-Gram No. C1.

"Design and Use of Cutting Tools," newly published 421 page book by the McGraw-Hill Book Information Service, 327 W. 41st St., New York 36, N. Y., tells how to select and use efficiently the numerous high-speed steel, cast-alloy, and carbide cutting tools available today. It is specifically designed to help machinists and tool engineers lower operating costs, eliminate waste, and produce better quality work. It contains more than 50 tested ideas for increasing tool life and for achieving higher cutting speeds and feeds. It offers many suggestions, too, for stregthening cutting edges so as to prevent trouble on tough machining jobs. Each kind of tool is analysed, every kind of tool angle treated, including end-relief, point clearance, side and back rake, etc., Chip formation and chip breakers, feeds and speeds, and tool grindings are all dealt with in a most comprehensive manner.

New Roller Chain Book contains 148 pages of detailed engineering information on the selection, installation, lubrication, and maintenance of roller chain for drives and conveyors, and for sprocket wheels. For reference and easy indentification, there are a great number of photographs and line drawings of the many available types and sizes of chain and sprocket wheels in the Link-Belt line. 50 typical conveyor chain attachments are shown. Where resistance to corrosion is required, the book offers a guide to the application of stainless steel and bronze chains. Charts, formulas, and tables are included wherever they are useful and necessary. Book No. 2475, Link-Belt Co., N. Michigan Ave., Chicago 1.
Circle Inform-A-Gram No. C2.

Two New Texts on Sheet Metal Shop Equipment, prepared especially for home study, have been added to the International Correspondence Schools course for sheet metal workers. They contain new sections on power machines, metal spinning, and drop hammers. They cover the whole range of equipment from straight hand shears to contour saws and stretch presses. Address I.C.S., Scranton, Pa.

This New Brochure from the Industrial Fasteners Institute, 3648 Euclid Ave., Cleveland 15, Ohio, is prepared as a means of assisting the most effective selection and use of lock-nuts. It gives complete information in a clear and precise manner, information made more valuable by photo and line illustration, correlated with the names of competitive manufacturers. Description and principle is followed by manufacturers address.
Circle Inform-A-Gram No. C3.



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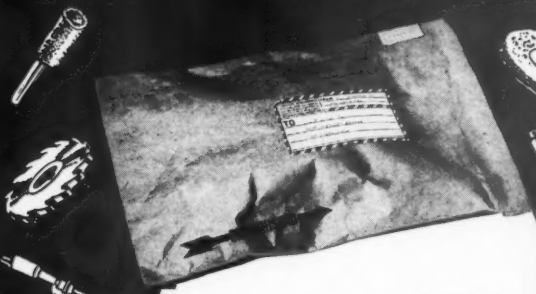

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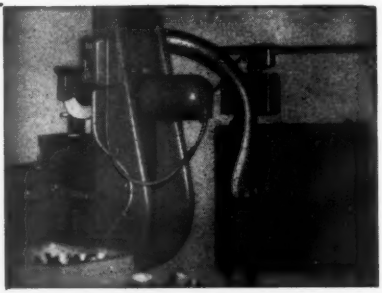

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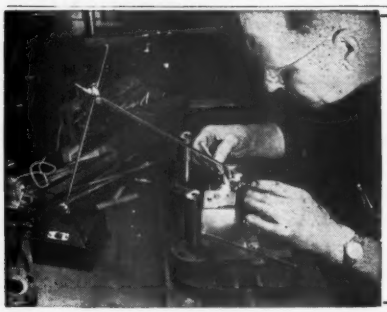

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Tool and Die Makers acclaim it for its utility, getting into nooks or crevices hard to get at with ordinary light—for lining up punches in dies, or working with the scriber in close places. Completely adjustable and portable. Light does not reflect back to your face. Ideal for Inspectors seeking burrs, flaws, etc. Price—complete with 2 size bulbs, $13.75.

Write for Literature

Twentieth Century Mfg. Co.

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"Recommended Practice for the Welding of Steel Castings" is the title of a 40-page booklet published originally by the Steel Founders' Society of America, and now available from the Tempil Corp., 11 West 25th St., New York 11, N. Y., to engineers and technicians who request it on their business letterhead. The booklet is divided into three sections, the first of which deals with welding methods and operation in general. The section following is devoted entirely to a comprehensive listing of electrodes, with their classifications and manufacturers. The last section contains listings of the various carbon and low-alloy steel castings, and gives the recommended procedure for each of them individually.
Circle Inform-A-Gram No. C4.

The Most Comprehensive Discussion of Plant Maintenance Problems ever compiled is contained in "Technique of Plant Maintenance — 1952", published by Clapp & Poliak Inc., 341 Madison Ave., New York 17, N. Y. It contains the proceedings of the annual plant maintenance conference and show, and is highlighted by the text of 717 questions from engineers of every major industry in the country who were at the conference. It therefore contains the best cross-section of current industrial engineering thought on maintenance problems. Topics include costs, inspection methods and records, planning and scheduling maintenance work, and lubrication. There are chapters on electrical equipment and plant buildings, and on the training of maintenance workers and supervisors. Chemical, steel, and automotive plants are dealt with in separate chapters.

A Decimal Equivalent Calendar Chart is available to readers on receipt of a company letterhead request to the Dayton Rogers Mfg. Co., Minneapolis 7, Minnesota.

"How To Do It" Book On Tool & Die Salvage is now being distributed by the Eutectic Welding Alloys Corp., 172nd St. & Northern Blvd., Flushing 58, N. Y. It is profusely illustrated, well-planned, 64 page publication. Contents include details of an effective tool and die welding salvage program; analyses of tools that may be successfully welded; new methods on production welding of tools; and technical data on the various Eutectic low temperature welding alloys that are particularly suited to tool and die work.
Circle Inform-A-Gram No. C5.

A 16mm Full-Sound, Full-Color Motion Picture entitled "The Story of High Speed Tool and Die Steels" has just been completed and is now announced by the Latrobe Steel Company, Latrobe, Pa. The film which depicts the making of tool and die steels at Latrobe, is available for showing before qualified business and technical groups. Arrangements for showing may be made with district representatives of the company, or by writing direct to the Latrobe Steel Company, Latrobe, Pa. All inquiries will be given immediate attention.

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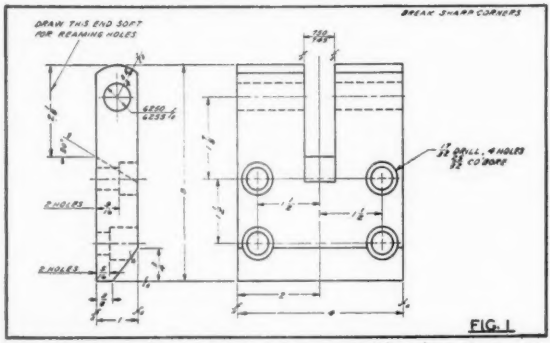
Cutting Costs by Practical Dimensioning

"Practical Dimensioning" is the title of an exceedingly interesting and helpful booklet recently published by one of our leading machinery manufacturers.

Many thousands of words have been written in various textbooks on mechanical drawing on the subject of dimensioning a drawing. The weight of dimension lines, size of letters and figures, size of arrow heads, etc., has all been set forth in minute detail. Attention to these individual details results in beautiful neat drawings, too many of which unfortunately fail to serve the prime function of a drawing, which is to tell the shop man exactly how to make a part that will function satisfactorily, that will be interchangeable, and that can be made inexpensively with the shop equipment available.



Most dimensioning errors can be listed under the following four headings.

1—Accumulation of tolerances.

2—Tolerancing to too close limits.

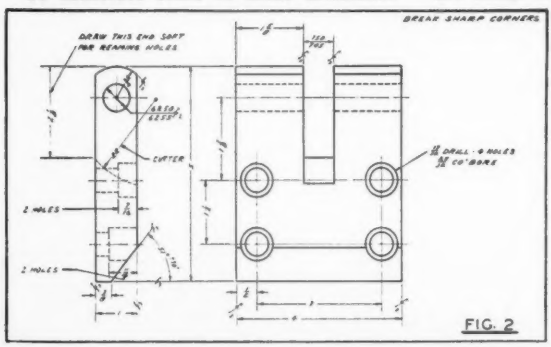
3—Improper choice of dimensions.

4—Failure to dimension from similar base lines on mating parts.

Recalling some of your own experiences with dimensioning errors of these four types will impress upon you just how much these errors can increase the cost of a part.

To illustrate some of these dimensioning errors, let us consider the cast iron stop block shown in Figure 1. Much of the machining on this block is for appearance only. The angle at the lower end of the block is for clearance, and the slot in the upper half of the block supports the pivot point of an air cylinder. This block is made in rather small quantities, and consequently not much money can be spent for tooling.

With the horizontal spacing of the bolt holes dimensioned as shown, a total spacing variation of plus or minus 1/32 inch could result which would take up all the clearance provided by drilling the bolt holes 1/32 inch oversize. Then when this spacing variation is applied to both rows of holes, with the possibility on the variation existing in both directions, it can readily be seen that the bolt holes will never fit the previously drilled and tapped holes in the mating part. If the holes are made to fit by slotting one or more methods result in increased cost and the possibility of errors. Also, since the ¾ inch wide slot has not been positively located from one side or the other of the block, it could be off location enough to cause binding at the pivot point.



In Figure 2 this part has been redrawn, and the dimensioning changed to correct these errors. Horizontal spacing variation of the bolt holes has been reduced from plus or minus

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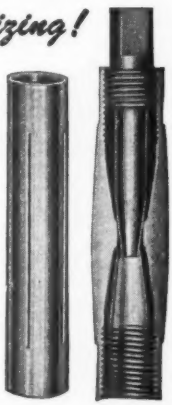

FEDERAL TOOL CORP. 3600 Pratt Blvd., Chicago 45, U. S. A.

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR KEY NUMBERS

of them or by slightly filing the bolts, assembly costs are increased, and it would be impossible to make a replacement part that would fit.

With the depth of the counterbores for the bolt holes dimensioned as shown, the machinist must subtract dimensions which introduces another possible source of error. The bottom of the ¾ inch wide slot is shown as a 30 degree angle. To machine this angle, a complicated angular set-up is required on the milling machine. However, the bottom of this slot is for clearance only, and consequently could just as well be shown with a radius. Drawn in this manner, the block could be held in a horizontal position in the milling machine vise.

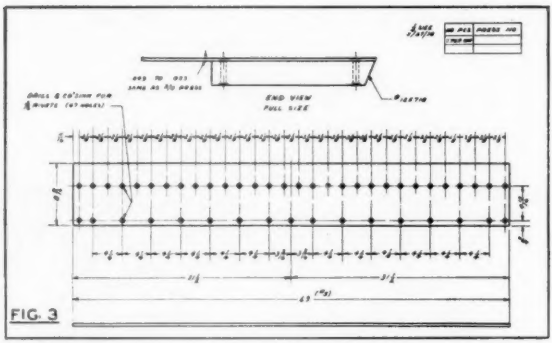

FIG. 3

The clearance angle at the bottom of the block being dimensioned as shown makes it necessary for the machinist to either calculate this angle, or to arrive at the proper setting by cut and try. Both 1/32 inch to plus or minus 1/64 inch. In addition to showing a radius at the bottom of the slot and giving an angular dimension for the clearance angle, the depth of the counterbores has been dimensioned directly, and the horizontal position of the slot has been located positively.

Since this is a stop or support block, it is not essential that the block be exactly 1 inch thick and 4 inches wide. The block would perform its function just as well if it were only ⅞ inches thick and 3⅞ inches wide. In this latter case, the block could have been made from 1x4 inch steel instead of having to be made from 1¼ x 4¼ inch steel. This would have saved approximately 1¾ lbs. of steel per block, and would reduce the amount of stock to be removed by more than half, thus reducing the machining time.

Figure 3 shows a most obvious example of the accumulation of tolerances that can result from "chain dimensioning". These parts are made in very small quantities, and when dimensioned as shown, the machinist, in laying out the horizontal spacing for the holes, would set his dividers for 2⅛ inches, and would then step off the 29 spaces to locate the holes on the upper center line. If he missed the divider setting by only .005 inches, the total cumulative error by the time the last hole was reached would be .145 inches. The .005 error in setting the dividers would not be unusual since the workman would be setting dividers to a 6" scale graduated in 64ths of an inch.

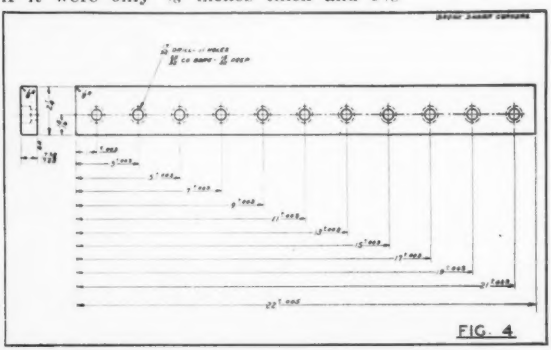

FIG. 4

Figure 4 shows a recommended method of dimensioning a series of holes. Here all dimensions are given from the left hand end of the part. All dimensions are actual scale readings and no addition or subtraction of dimensions is required. Consequently, no tolerances can accumulate, the possibility of shop errors has been greatly reduced, and the part can be made inexpensively and will be interchangeable.

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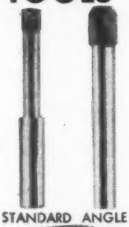

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The precision-built boring head with anti-friction bearings is equipped with an adjustable guide support that is moved down close to top of the work for precision accuracy during drilling and reaming operations. Extra large bearing area on the boring head assembly base assures travel at exactly 90° on two accurately ground ways across a solid bridge. Another built-in quality feature that insures greater precision and longer life of the machine is the hand-scraped ways in the table. The work is securely clamped to the long slide rail which moves in these hand-scraped ways and locates the work under the boring head.

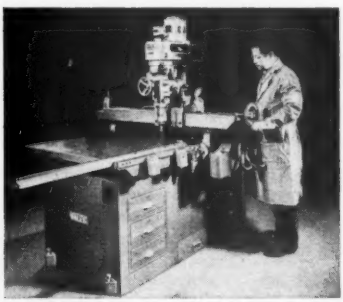


Fig 1. Front view of the Deluxe Model drilling machine boring the work located on table.

Two speed gearing, controlled by hand wheels, provides rapid traverse for rough positioning and 2 built-in "Scan-A-Scales" zero-in the work to tolerances as close as ten thousandths of an inch. Air clamps rigidly lock both boring head and slide rail in exact position.

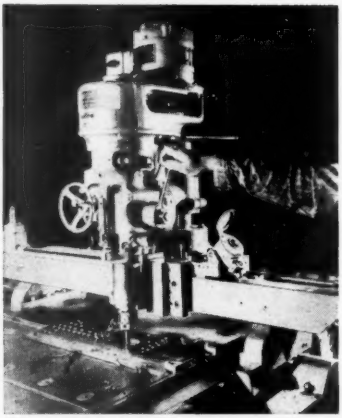


Photo Courtesy Wales-Strippit Corp.

Fig. 2. Close-up of boring operation.

Full size table provides complete support for work assuring greater accuracy and easier movement of the work is provided by anti-friction ball inserts located over the entire table area. Two sets of handy steel drawers are conveniently located in the base for holding boring tools, drills, reamers and other accessories.

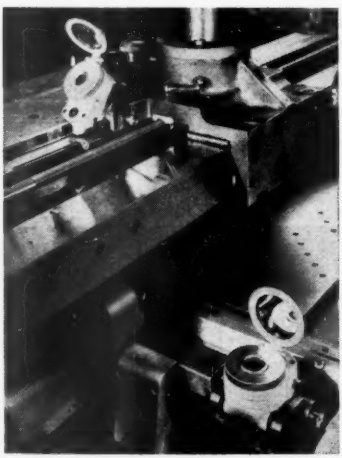
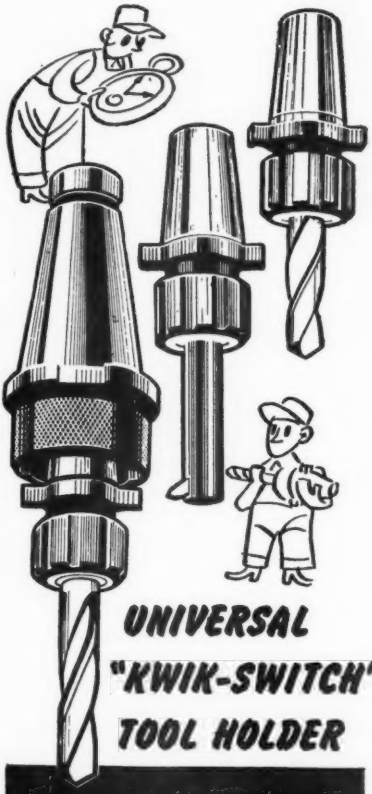


Fig. 3. Showing the pair of "Scan-A-Scale" dials that "zero-in" the location of the work to tolerances as close as ten thousandths of an inch.



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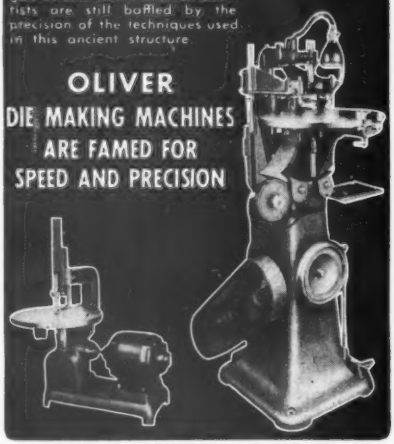

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Indexable Carbide Inserts Give Maximum Tool Life

A mass production job is being performed at the Bendix Pacific Division Plant No. 2 in which a Motch & Merryweather transfer machine is tooled up with tool bit holders designed to take ½" square indexable cemented tungsten carbide inserts. The design of these inserts is shown in Figure 1.

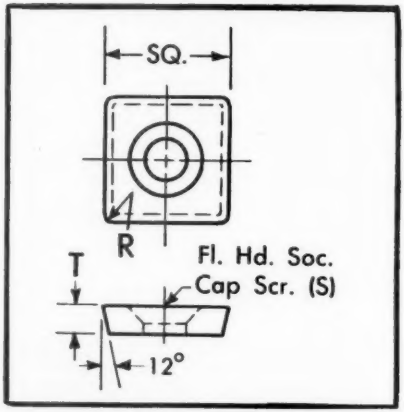
The work pieces are lengths of Shelby seamless stainless steel tubing, 3⅛" in diameter which have to have the inside and outside diameters of both ends chamfered and faced. The finished part is a tractor accessory actuating cylinder.

The transfer machine used has two special facing heads, Figure 2. Each of these heads is set up with a set of three indexable holders and carbide inserts which are shown in Figure 3. One tool is set to chamfer the outside diameter, another the inside diameter and the third to do a facing job.

The operational sequence is: seamless stock is fed into the machine; cut off by saw to predetermined length; and then transferred to four clamping jaws, Figure 4. Next, the inside and outside diameters of each end are chamfered and the ends faced to the desired length simultaneously, then ejected.

Width of cut on each insert is less than ¼". Since each cutting edge of the inserts is ½" long, it is possible to position the chamfer holders, so that the actual cutting is performed toward the end of each cutting edge, thus using only about one half of each cutting edge for one cut. Therefore after indexing each insert four times, outside and inside diameter inserts are interchanged to provide an additional four indexes per insert. The facing holder is simply moved in its slot to obtain two cutting positions on each of the four cutting edges, or a total of eight positions. Utilization of inserts in this manner en-

(Continued on page 186)



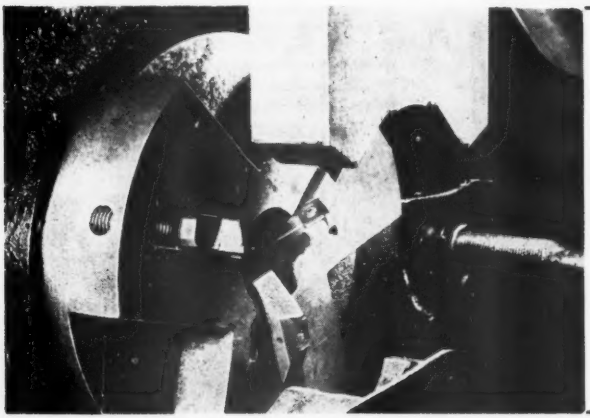


Fig. 1. Above. Indexable carbide insert. Two sets of three of these inserts are used on this chamfering and facing job.

Fig. 2. Left. Illustration shows one of the two special facing heads used on the transfer machine. The I.D. and O.D. chamfering tools can be seen mounted on the upper, part of the head while the facing tool is shown at the bottom.

Photos courtesy Kennametal, Inc.

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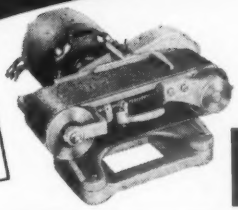

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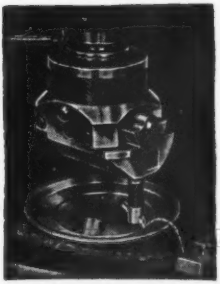

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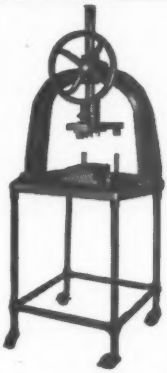

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Abrasion Tester for Cylindrical Parts

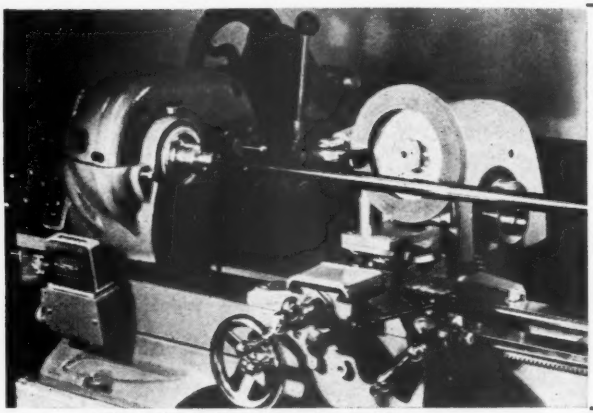


Photo courtesy Taber Instrument Corporation.

As shown at the left, in making the abrasion-resistance test the gun barrel is rotated between centers. The particular spot to be tested is in contact with the abrading wheel. Constancy of pressure during the test is assured by a floating dead weight lead system.

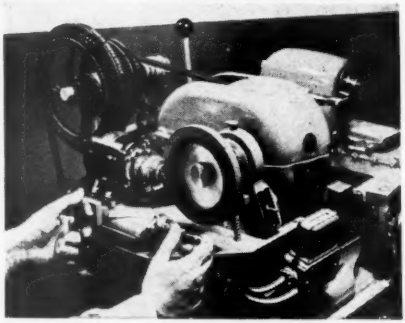
The operation shown below is that of refacing the abradant wheel. At the left of the driving head is a motor driven refacing wheel which is brought to bear on the abradant by means of a hand feed screw.

The illustration above shows a 34" rifle barrel being tested to determine the amount of wear from handling which it will withstand before the blue oxide finish is worn thin, resulting in corrosion of the part.

The setup employs a newly developed abrasion testing machine for rating the wear resistance of protective finishes, i.e., black oxidized or electroplated coatings, extruded plastic and enamel applied to aircraft, ordnance and metal furniture tubing and other cylindrical parts or test pieces.

The test is performed by placing the gun barrel between two driving centers with the test surface in contact with the abrading head. This abrading head can be adjusted lengthwise of the barrel to any position within its range. Pressure of the abradant against the test surface is applied by a floating dead weight load system, which compensates for minor inaccuracies of the test part. The resulting wear is comparable to a gun being handled under field service conditions.

The abrasion tester is fully adjustable to take cylindrical specimens from ½" to 6" in diameter and 8" to 36" in length. The width of the wear track is normally 1" however, the face of the abrading medium can be narrowed to wear a track



only ½" in width, where required. The abrasion resistance is reported as "number of wear cycles" the surface will withstand before penetration of the protective finish permits corrosion to take place. The end point for corrosion resistance is determined with an indicator solution; however, a visual end point can also be used by comparing with a standard. The wear cycle is one complete revolution of the abradant wheel.

A refacer for the abradant is located at the left of the driving head, as shown in the lower illustration. It consists of a motor driven refacing and a mounting on the main spindle shaft to recive the abradant wheel. The main spindle turns the latter while the motor driven abrasive wheel is moved across the face of the abradant by means of a handfeed screw.

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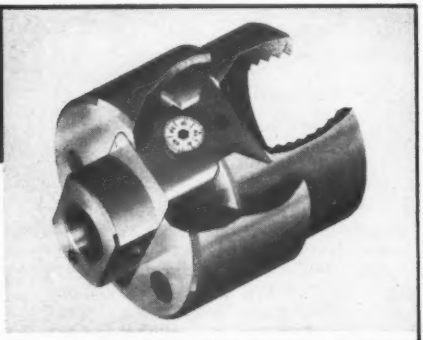

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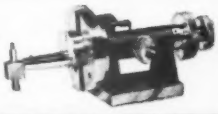

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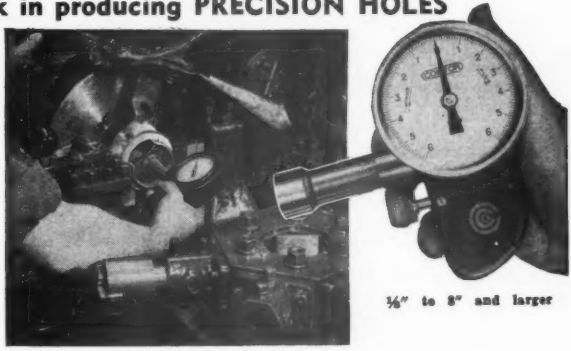

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Shown at right is the first in a new line of machines for chamfering zerol bevel gear teeth. The machine deburrs and chamfers tooth edges at both heel and toe of a 8" dia., 99 tooth, 12.53 pitch aircraft zerol bevel reduction gear in 30 seconds cutting time.

Pressing the cycle start button on the machine causes the work to be brought into cutting position by a pneumatic cylinder. The teeth are then chamfered by rotating the work in timed relation to the cutting action of four dovetail-type high speed steel form tools. When the cutting cycle is completed, the work is automatically positioned for unloading.

Four form tools are provided to chamfer the entire tooth contour at both heel and toe ends. These tools are actuated by a combination rocker arm motion that gives a generated cutting action which enables the form tools to chamfer and deburr the tooth edges well around the root of the gear tooth, leaving a burrless chamfered surface.

The zerol bevel gear is located in the fixture by a pilot. Three spring loaded locators spaced at 120 deg. (for accessibility) on the outside of the fixture are provided for radial location. The operator locates the part radially in the fixture by depressing any of the locators into a tooth space.

Clamping of the work in the fixture is accomplished by sliding a C-washer over a draw bar and turning a handwheel under the fixture. The work is unclamped by loosening the handwheel and sliding off the C-washer.

Photo courtesy Modern Industrial Engineering Co.

In actual operation, the head of the machine is enclosed with a guard having sliding doors. This guard is provided for operator safety as well as chip control.

The machine base is fabricated rolled edge box construction and the head frame is alloy cast iron. Design features include special alloy bronze arm bearings that withstand high compression loads, an overload clutch that prevents damage to machine parts in case of accidental overloads, and a precision type index mechanism that runs in a bath of oil. All electrical equipment is of JIC standards.

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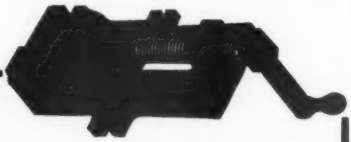

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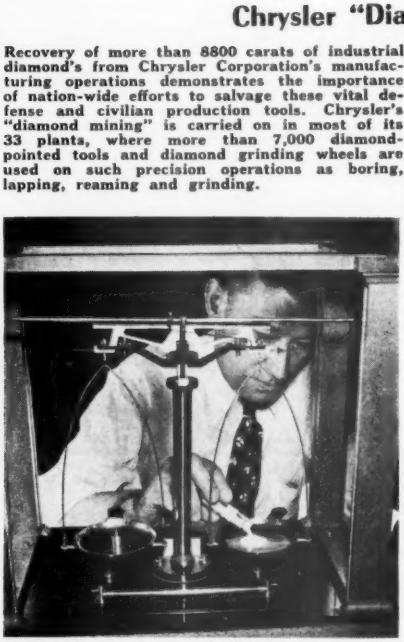
SEE ADVERTISERS INDEX, BACK OF BOOK, FOR KEY NUMBERS

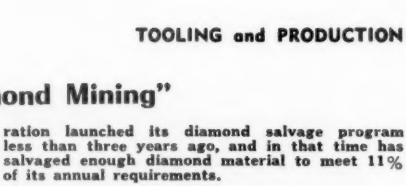
Chrysler "Diamond Mining"

Recovery of more than 8800 carats of industrial diamond's from Chrysler Corporation's manufacturing operations demonstrates the importance of nation-wide efforts to salvage these vital defense and civilian production tools. Chrysler's "diamond mining" is carried on in most of its 33 plants, where more than 7,000 diamond-pointed tools and diamond grinding wheels are used on such precision operations as boring, lapping, reaming and grinding.



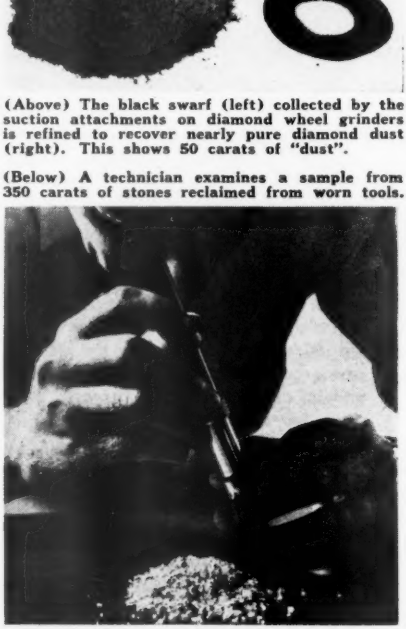
A. E. Chilcott (above) who heads Chrysler Corporation's non-productive material control department, weighs 50 carats of diamond dust reclaimed from factory grinding operations. Mr. Chilcott said that Chrysler has established a central depot and salvage program for recovering impressive quantities of industrial diamonds and dust from the "swarf" and "sludge" of diamond-bearing wheels and tools.

D. L. Vande Bunte (above) laboratory supervisor, examines industrial diamonds reclaimed from worn or broken diamond-pointed tools. Binder holding the diamonds in the tools is dissolved in special chemical bath. Chrysler Corporation launched its diamond salvage program less than three years ago, and in that time has salvaged enough diamond material to meet 11% of its annual requirements.

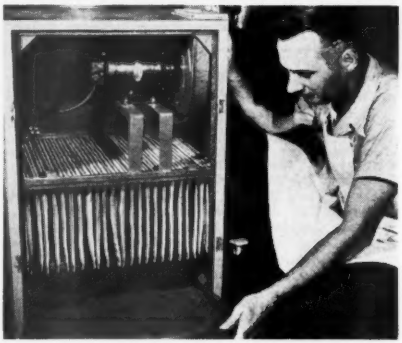


(Above) The black swarf (left) collected by the suction attachments on diamond wheel grinders is refined to recover nearly pure diamond dust (right). This shows 50 carats of "dust".

(Below) A technician examines a sample from 350 carats of stones reclaimed from worn tools.



(Below) Swarf collected by the filter bags is chemically treated for diamond dust recovery.



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100 YEARS OF SERVICE ROUNDS SQUARES FLATS HEXAGONS
TOOL & DIE MEN SPECIFY
HY-TEN
"M" TEMPER ALLOY STEEL
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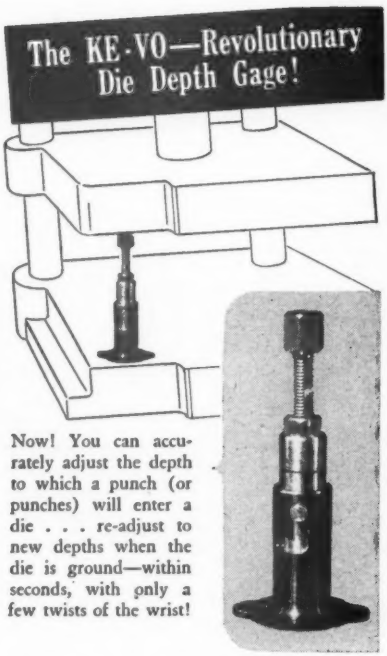
The KE-VO—Revolutionary Die Depth Gage!



Now! You can accurately adjust the depth to which a punch (or punches) will enter a die . . . re-adjust to new depths when the die is ground—within seconds, with only a few twists of the wrist!

Protect *all* your blanking, forming and drawing dies against damage due to over-striking or handling . . . increase their working life . . . slash die set-up time . . . and cut scrappage to a minimum — with the KE-VO Die Depth Gage! Permanently mounted on the die shoe, KE-VO adjusts in a jiffy to 4½" high, $2\frac{9}{16}$" low. Unique design permits locking gage out of striking position when in production.

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Order several KE-VO's for *all* your dies TODAY! Hundreds in use *prove* their value!

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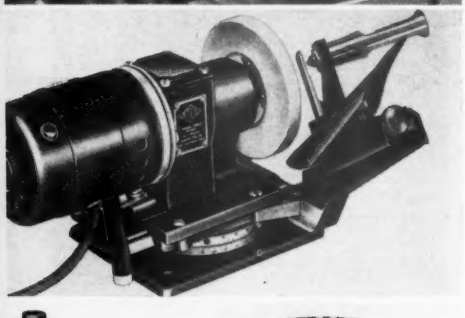
BOX 97, PROSPECT HTS., ILLINOIS

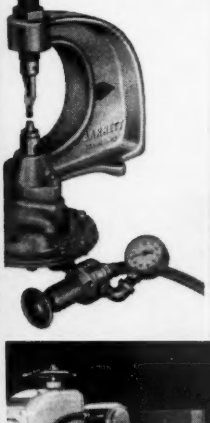
PROGRESS

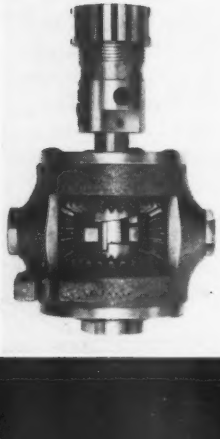
NEW DEVELOPMENTS • IMPROVEMENTS • COST AND TIME SAVERS

A Highly Accurate Vise, exact to within .0003" on five surfaces, is being made by Erickson Tools Division, Erickson Steel Co., Hamilton Ave., Cleveland 14, Ohio. This fixture has been found to save from two to three hours in set-up time for certain grinding, milling, drilling, jig boring and other machine operations. Adaptability is especially great when used in conjunction with a sine plate, otherwise difficult work becomes routine.
Circle Inform-A-Gram No. A1.



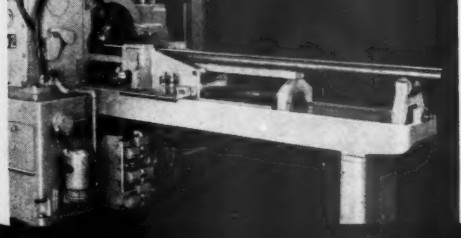
Outstanding New Diamond Wheel Dressing Machine by the Eastern Tool Co., East Hartford, Conn., is easily mounted on work table and dresses radii, periphery, and angles from +.00025 to —.0005. New cutting edges are exposed with a minimum removal of stock. A vernier scale is built-in for rapid and accurate angle setting. Write for full information to the manufacturer.
Circle Inform-A-Gram No. A2.





Light, Low-Priced, Fast-Operating Air-Power Riveter has just been announced by the Barrett Equipment Co., 21st & Cass, St. Louis 6, Mo., It can be applied to riveting, de-riveting, punching, stamping, and forming merely by changing tools. Although designed for bench installation, it can be installed either on a base or stand. Air line pressure of 100 psi produces a working pressure of 1100 lbs. with 11/16" stroke. Standard foot control; or hand or automatic control may be used.
Circle Inform-A-Gram No. A3.

"Burgmaster" Tapper Combines Compactness and Capacity. Made by the Burg Tool Mfg. Co., 3743 Durango Ave., Los Angeles 34, Calif., it has a range from #10 - ½" N.F. with two collets. Taps are centered and held securely by a rubber-flex tap chuck and are driven through a tang drive. Rugged construction and dependable performance provide more economical tapping with less operator fatigue. Write maker for detailed literature.
Circle Inform-A-Gram No. A4.

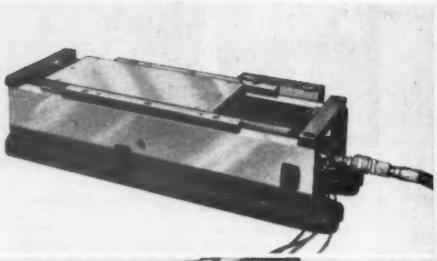


New Stock Feeder has been designed for the Motch & Merryweather No. 2 Circular Sawing Machine. Designed particularly to feed bar stock for shell forgings, feed is automatic after the initial squaring cut. Grippers clamp the stock, and a slide, operating between positive stops, moves the stock forward the required length. A vertical vise then clamps the stock, and the slide returns to the rear stop and the grippers reclamp. Slide movement and clamping are by hydraulic cylinder, sliding surfaces are automatically lubricated. Motch & Merryweather Machinery Co., 715 Penton Bldg., Cleveland 13.
Circle Inform-A-Gram No. A5.

ON PARADE

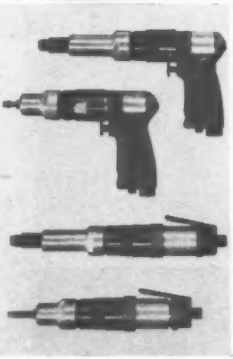
Mail FREE Inform-A-Gram Card for MORE Details.

New Air Powered 2 Station Work Feeder. "Transfeed" by the Bellows Co., 230 W. Market St., Akron 9, Ohio, has an air operated, electrically controlled mild steel table top, with a 6" transverse positioning stroke. The operator can load and unload work at one end of the table while machining is taking place at the other. Work-holding fixtures may be mounted directly to the table, and the unit is equipped with adjustable positive stops for accurate work positioning.
Circle Inform-A-Gram No. A6.

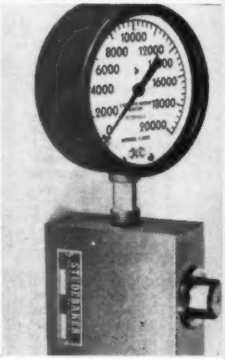


DoALL "Chromium-Carbide" Gage Blocks have the well-known hardness of carbide with the same coefficient of expansion as steel to eliminate the necessity of making expansion corrections when checking steel parts. Surface finish is vastly superior to that obtainable with tungsten-carbide blocks, resulting in considerably greater wear life. Perfect stability is another feature. Blocks will not "grow" or "shrink" with age, and if dropped do not change size as a result of internal structural alteration. DoALL Co., Des Plaines, Ill.
Circle Inform-A-Gram No. A7.

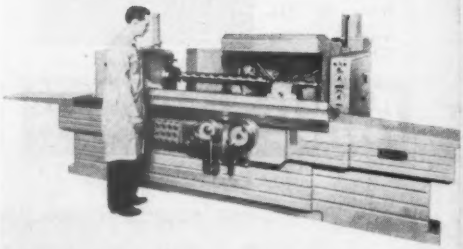
A New Series of Midget-Size Air Driven Screwdrivers and Nutsetters has been added to their line of portable air tools by the Master Pneumatic Tool Co., 2100 Keith Bldg., Cleveland 15, Ohio. Screws up to #12, and nuts and bolts to ¼" may be driven. Available speeds are 580, 1200, and 2400 rpm. Tools are light in weight and well-balanced for easy handling; operate on air pressures from 80 to 100 lbs., and may be fitted with either pistol or lever type throttle handles.
Circle Inform-A-Gram No. A8.



Tester Gives Accurate Pressure of Ram on Work. The Studebaker Machine Co., 1216 S. 9th Ave., Maywood, Ill., announce new tester for determining weights and total pounds pressure on all types of presses. It is most valuable in insuring quality control against inaccurate ram pressures, and has self-contained hydraulic unit. Sizes from stock 0 to 10,000, 0 to 50,000, and 0 to 100,000 lbs. Specials to order.
Circle Inform-A-Gram No. A9.



Style 36 Ex-Cell-O Precision Thread Grinder has flexibility, accuracy, and automatic cycle. It will grind single or multiple threads left or right hand, in any pitch from 1 to 128 threads per inch. It can be used with single or multiple rib grinding wheels, and an attachment for grinding accurate internal threads is also available. More detailed information from the Ex-Cell-O Corporation, Detroit 32, Mich. Request bulletin 48824.
Circle Inform-A-Gram No. A10.



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Acro Pin Oilers, as illustrated, fit over each leader pin and seals in place with a rubber neoprene washer. Each cup is filled with oil so each downward stroke brings bushing in contact with oil and each upward stroke distributes oil evenly over leader pins. Eliminates bushing wear, leader pin scoring, and maintains die accuracy.

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***List of users on request.**

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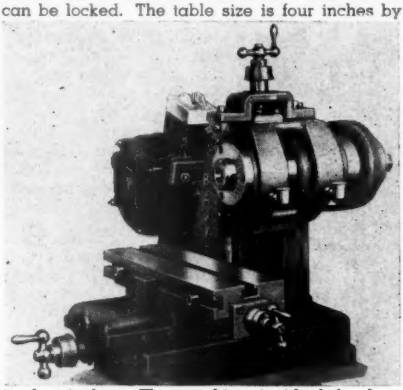
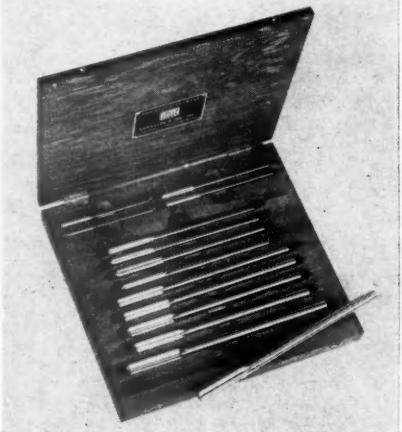
Improved Barker Tool Room Bench Type Miller features micrometer feed screws, and three way travel. Head travel is 3¼", table travel 5", and saddle travel 3". All travels can be locked. The table size is four inches by



twelve inches. The machine is ideal for handling small run precision jobs, as it is easily set-up and changed over. High spindle speeds make possible use of carbide cutters. Barker Engrg. Co., 500 Green Rd., Cleveland 21, Ohio. **Circle Inform-A-Gram No. A11.**

Special Reamer Set for Dowel Pin Holes has been developed by Lavallee & Ide, Inc., Chicopee, Mass. The set consists of fourteen reamers, in pairs from ⅛" by sixteenths. Each pair includes one reamer .0020" undersize, and one .0005" undersize, except the ⅛", which are .0020" and .0003" respectively. Tolerances are

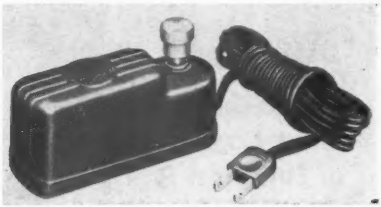


+.0000" and —0002". All sizes have a back taper of .0005" per 1½", with no flute relief. **Circle Inform-A-Gram No. A12.**

Combination Work Tables and Tool Racks for Wales Sheet Metal Fabricator are illustrated. Placed on each side of the Fabricator, they are

of the same height as the bed table. The combination, adjustable front-to-back, is equipped with adjustable feet for leveling, gives additional work and storage area. Wales-Strippit Corp., 245 Payne Ave., N. Tonawanda, N. Y. **Circle Inform-A-Gram No. A13.**

New, Portable De-Magnetizer. "Miti-Mite" De-Magnetizer No. 500 announced by the Enco Mfg., Co., 4520 W. Fullerton Ave., Chicago 39, Ill., de-magnetizes any part simply by sliding it over the surface to be treated. The unit is exceedingly compact, so that it may easily be used in cavities of die cast molds or employed



to remove stray magnetism collected in punches or stamping dies. The body of the unit is made in non-breakable molded plastic, has attractive lines. The activating switch is of the push-button type, and is easily pressed by the forefinger while holding the unit. Three poles of laminated silicon steel are set flush with the bottom surface of the body. Unit cannot scratch or mar highly polished surfaces. **Circle Inform-A-Gram No. A14.**

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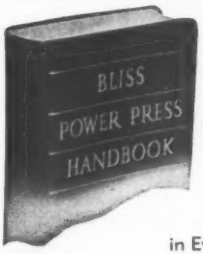

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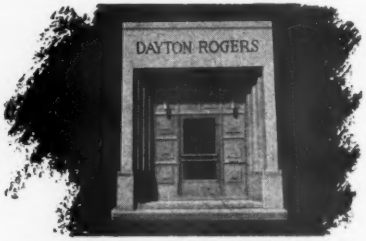

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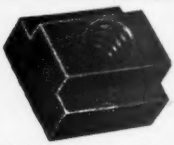

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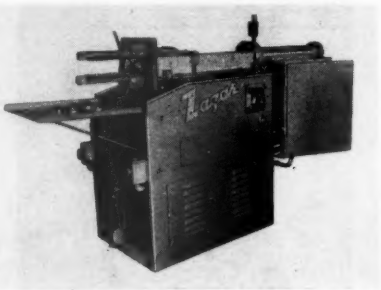
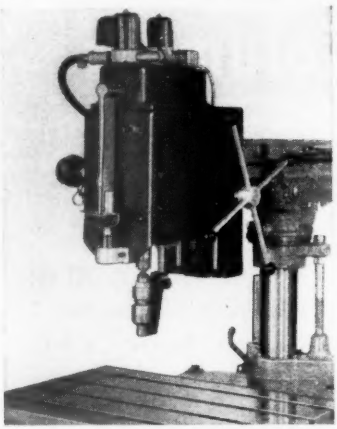


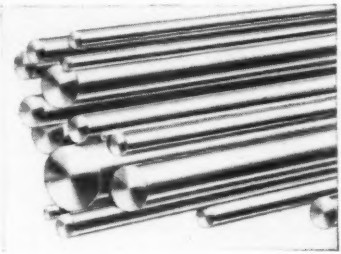
hands free. Machine is hydraulically operated and electrically controlled, with integral coolant system for light or heavy coolants. Data: max. pull 6000 lbs; feed stroke variable from 2' to 27' ft/min; full 20" return stroke in 1½ seconds. Cycles at 700 strokes per hour. Zagar Tool Inc., 24000 Lakeland Blvd., Cleveland 23. **Circle Inform-A-Gram No. A15.**

Large Model MA-500 Power-Torque Tool illustrated is designed by Garvin Bros. Inc., P.O., Box 536, South Bend Ind., to handle a torque



range to 0 to 2760 inch-lbs. Torque is measured in motion and controlled to within 2% of desired limits. Ideal for heavy production nut-running and screw and fastener driving, and for testing pre-loaded bearing assemblies on the production line.
Circle Inform-A-Gram No. A16.

Two New Lead Bearing Steels have been announced by La Salle Steel Co., 1412—150th St., Hammond, Ind. "Super La-Led" has highest sulphur content of any steel produced commercially in this country, tests showing that it machines 80% faster than B1113. In addition



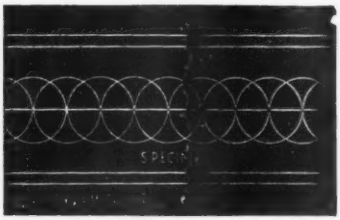
to its use in regular steel applications, it will often replace brass because of its exceptional machinability. Leaded TS 4140 Modified will machine one third faster than a comparable non-leaded steel, while its physical and mechanical properties are not appreciably affected.

Circle Inform-A-Gram No. A17.

Pocket Size Metal Hardness Tester weighs only 7 ounces, gives direct readings on any of three different Rockwell and Brinell scales without the use of conversion charts. It has made possible the testing of internal mould and die sections with an area as small as one square inch. Available tests show the instruments to be as accurate as heavy standard equipment. This low cost, portable instrument allows work (including round parts in lathes) to be tested without removal from the machine. Operation

is very simple, there being only two moving parts in the instrument, while service is not required since calibration can be checked by using standard test blocks of known value. There are no diamond points to grind or wear out, and no penetrating balls to deform, as is the case with standard machines. Other materials than metal may be successfully tested. Peabody Industries Inc., 1819 Broadway, New York 23, N. Y.

Circle Inform-A-Gram No. A18.



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Circle Inform-A-Gram No. 179B

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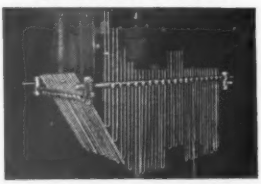
for Power Presses



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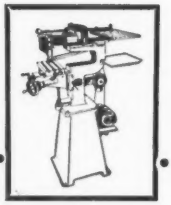

Pictured above is the PREIS - PANTO Model 2D-4 Precision Engraving Machine for use on large metal or plastic panels, signs and name plates; steel stamps and dies or any product requiring precision engraving.

Pictured at left is the PREIS Universal work holding fixture designed especially for **quick** holding of work in any engraving machine.

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732 So. 13th St. Newark 3, N. J.

Finger Tip Control Tapping Chuck gives extreme sensitivity and precise control in use of small taps for high volume production work. It is made by the Commander Mfg. Co., 4225 W. Kinzie St., Chicago 24, Ill. It is designed for use with the Commander tapper, permitting maximum use of the tapper's spring clutch drive and adjustable torque control features. The new chuck has a drive engaging collar, a ⅛" turn of which disengages the tap from the drive, permitting the operator to "feel" the tap as it enters or leaves the work. Vertical movement of the tap to ¾" is controlled by the operator's finger tips. Lost time and waste motion usually encountered in controlling the tap by the drill press handle are eliminated, control bettered.

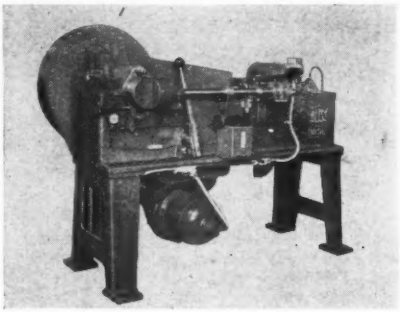
Circle Inform-A-Gram No. A19.

Series 1800 Shear-Speed Shaper Line features twelve design improvements and capacity increase for improved performance, reduced tool change time, and easier maintenance. New Model 18105 with a 5" cutter head stroke replaces the former Mod. 18103 which had a 3" max. stroke. The line now includes four models with capacities ranging from 1" dia. to 10" dia. gears with max. face widths from 2¾" to 4½". The line is designed for cutting of spur

gears, involute, angular, straight-sided and inverted splines, sliding clutches, toothed parts, ratchets, and special forms. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.

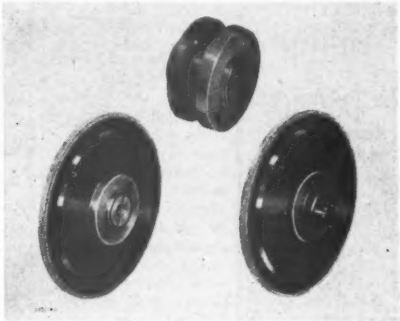
Circle Inform-A-Gram No. A20.

New Bliss Press Pierces 20MM Cartridge Cases. Capacity of this press is five tons, piercing the flash hole in one stroke at the rate of 60 pieces per minute. Hand filled chute



feed has three stations. The first is work positioning detector, the second the work station, and the third checks correct piercing. The first and the third stations have solenoid switches to stop the press in case of improper loading or faulty piercing. Further information from the E. W. Bliss Co., Canton, Ohio.
Circle Inform-A-Gram No. A21.

Reversible Wheel Adaptor allows the wheel to be reversed on the spindle without the delay and expense of re-truing. Also, on any formed or angular periphery type surface grinder wheel it permits quick and accurate wheel removal and reversal for grinding left or right handed tools or parts. The adapter is designed for No. 2 B & S and similar machines having



1" spindles with 3"/ft taper; has positive locking device to prevent wheel loosening. Detroit Milling Cutter Co., 28625 Grand River Ave., Farmington, Mich.
Circle Inform-A-Gram No. A22.

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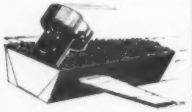

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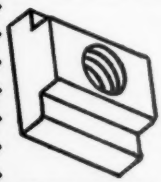

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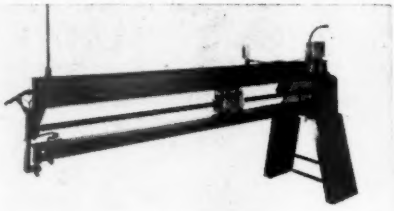
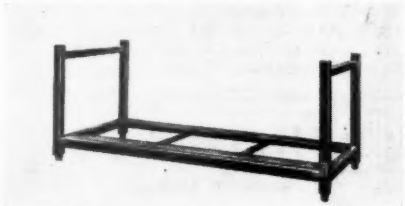
EDWARD D. STRAND COMPANY
Box 54, West Side Sta., Worcester, Mass.

The Standard Power Groove Sheet Metal Joiner is made to automatically seam sheet metal of any thickness from 18 to 30 gauge.



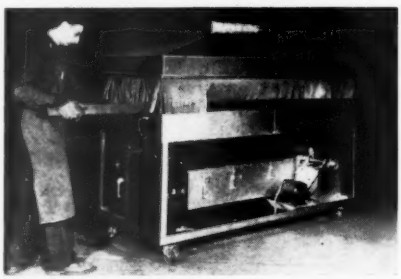
Work is seamed under a pressure of 11,000 P.S.I., and in two directions. The roller assembly exerts force against an overhead structural beam, and at the end of the stroke automatically reverses direction for a second operation. Standard Power Groove Machine Corp., 99 Hudson St., New York 13, N. Y.
Circle Inform-A-Gram No. A23.

A Folding Stock Rack with no detached or loose parts is made by Equipment Mfg., Inc.,

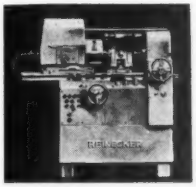


21550 Hoover Rd., Detroit 5. Principle advantages are conservation of space and elimination of loose parts. Provision is made for easy separation and locking of the components.
Circle Inform-A-Gram No. A24.

This Special Aluminum Bar Heating Furnace has been developed by the Pereny Equipment Corp., Columbus, Ohio, for heating to 3000°



F prior to forming operations. It is typical of the line of standards and specials in ranges from 300-5000° F made by this company.
Circle Inform-A-Gram No. A25.



Internal And Face Grinding Operations are performed in a single setting of the workpiece, in the Reinecker Mod. JSOP, by Kurt Orban Co., Inc., 205 E. 42nd St., New York 17. The grinder has hydraulic, infinitely variable table movement, grinding wheel infeed and hydraulic movement of the face grinding bracket, which is adaptable for cup and face wheels. Chucking is magnetic, collet, or three jaw, wheel redressing is semi-automatic.

Circle Inform-A-Gram No. A26.

New Bench Model Honing Machine & Portable Coolant Unit. The honing machine is designated model "J", and incorporates the basic features of the floor model (model AL) made by the same company, featuring infinitely variable spindle speeds and a honing range from .185" to 2.500" diameter. The coolant unit is adaptable to any dry honing machine. Superior Hone Corp., 1605 Elreno St., Elkhart, Ind.

Circle Inform-A-Gram No. A27.

Claw Tooth Narrow Width Band Saw from the DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill., has several interesting features. Tooth tip has a positive rake angle to give free cutting with less than usual feed pressure. Good performance is obtained on wood and plastics, non-ferrous metals and alloys. The saw is not intended for resharpening.

Circle Inform-A-Gram No. A28.

Metal-Cutting Band Saw Has 8'8"x10' Table. This huge band saw, made by the Tannewitz Works of Grand Rapids, Michigan, will be used with a 50,000-ton press for trimming the edges of complete airplane wing stampings. It is equipped with two 36" wheels above and below the cutting area, and a third 30" wheel in the left table column. It is one of a number of models available for maximum savings.

Circle Inform-A-Gram No. A29.

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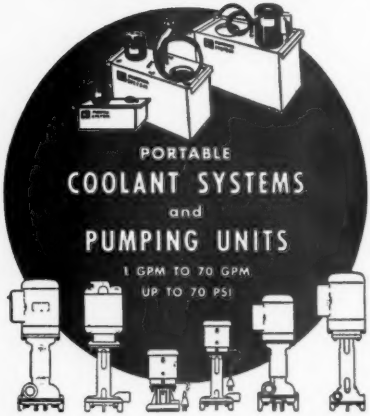

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. . . Testing, from page 152

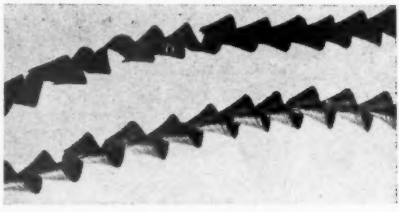
Fig. 3. One hundred different fluids were tested during the development of a new wax-type cutting oil. The technician above is applying one of the fluids to steel samples which were tested for the amount of power required to tap ½ x 13 threads.

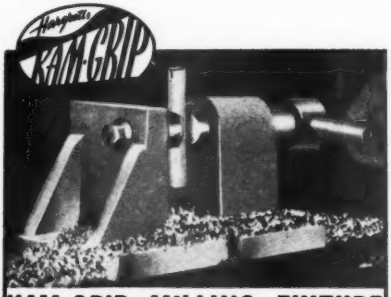
sulphur. It will not stain non-ferrous metals nor damage machine bearings or gear mechanisms and may be used in machine tools using a universal lubricant.

It is designed for use in automatic screw machines, gear cutting machines, broaches, lathes and other types of machine tools which use oil-type cutting fluids.

Golden in color it enables the operator to observe the progress of his work through the fluid. Its lack of odor, due to the fact that it will not turn rancid and its faculty for drastically reducing smoking are expected to meet with the approval of machinists.

Fig. 4. These metal curls were taken from an automatic screw machine making a small ring-shaped part. The clear metallic color of the chip shown at the bottom, taken from a machine using the new wax-type cutting oil is evidence of the effectiveness of the lubricant in reducing heat. The scorched chip at the top was from a machine using E. P. oil.





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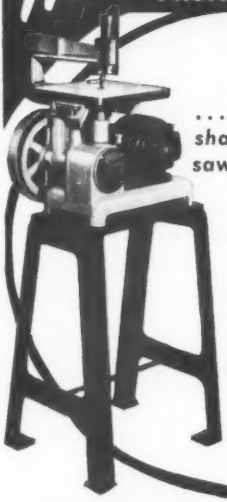
DIE FILERS
PROFILE GRINDERS



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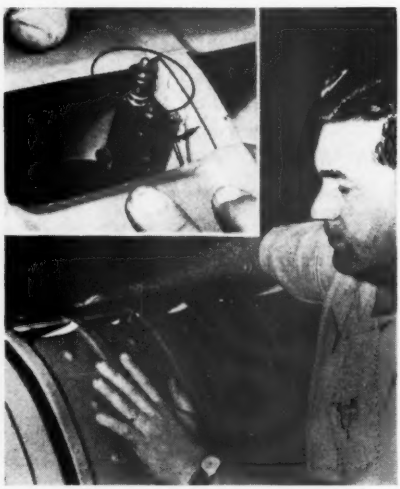
Jig Loading Facilitated by Stops

Spring-loaded stops which have recently been attached to assembly jigs at Temco Aircraft Corporation, Dallas, Texas, are helping employees to position inner skins on Lockhead P2V Neptune outer wing panel leading edge jigs, thus speeding up jig operations and eliminating rework due to improperly located skins.

Previous to the development of the new stops by J. D. Bragg, a Temco production leadman, the skins were positioned in the jigs by aligning their edges with marks on the jigs. This operation proved time-consuming, but positioning devices which extended beyond the inner skins interferred with the installation of the outer skins.

Bragg suggested that spring-loaded stops having a diameter equal to the required spacing be made and installed on the leading edge jigs. Thus, when the inner skins are butted against the stops and clamped to the jig, the proper spacing is assured. When the outer skins are later installed, the weight of the material pushes the stops back out of the way.

Since the development of the stops, jig operations have been speeded up and rework due to improperly spaced skins have been completely eliminated.



. . . Indexable Inserts from page 166

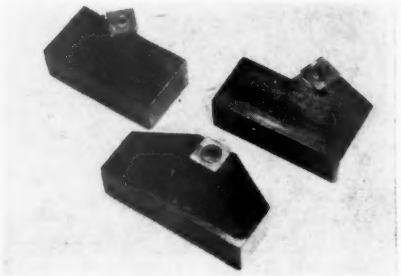


Fig. 3. Two chamfering and one facing indexing tools utilizing ½" square carbide inserts. These are used on special facing heads for simultaneously machining both ends of stainless steel cylinders.

ables 150 to 160 pieces to be machined per index—or 1200 to 1280 pieces for the eight indexes. The feed is 0.005" per revolution at a speed of 400 rpm or 363 sfm.

After machining the above number of pieces, inserts are reground on top of tip only and indexing sequence repeated. Two such regrinds are possible to give a total of 3600 to 3840 pieces per set of six inserts. Changing time for the six inserts requires less than ten minutes:

Thus the indexable feature of the insert is fully utilized to give maximum tool life with minimum of down time. A ten-to-one soluble oil is used as a coolant during sawing but the carbide tips are used without any coolant.

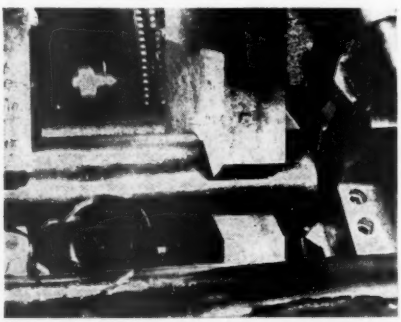
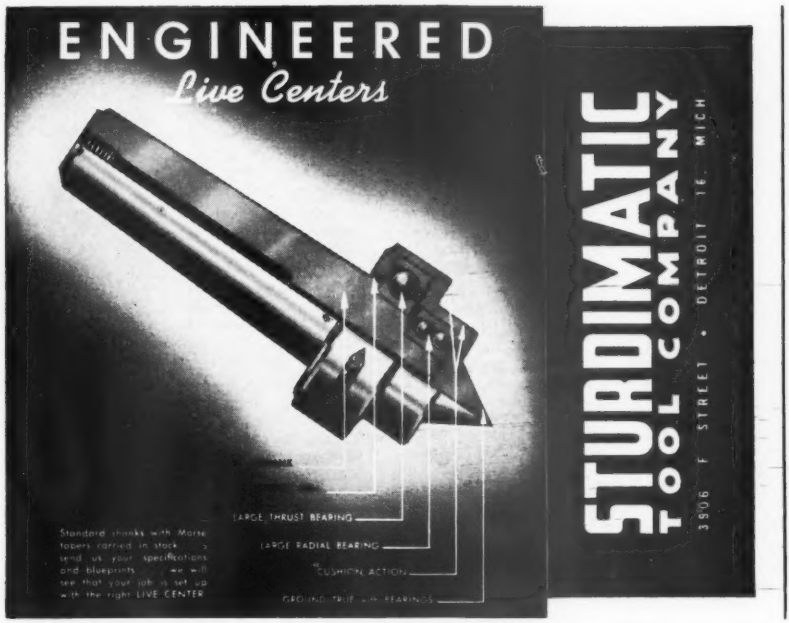


Fig. 4. Close up view of cylinder clamped in transfer machine. The position of the O.D. chamfering tool and the facing tool can be seen.



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Overall Length—8¼"
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Whether to use hot finished, cold drawn, or "roto-rocked" seamless mechanical tubing as a basis for your product is exhaustively discussed in this bulletin.

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IDEAL TAPE

Ideal Industries, Inc. have just issued a new catalog on their recently developed line of friction, rubber, and plastic tapes for general industrial application.

Circle No. E6.

BUNTING NEWS

New catalog No. 52 from Bunting has complete listings of bronze bearings, bushings, and bars produced. Get yourself up-to-date with a copy.

Circle No. E1.

DIE MAKING

Brochure "The Story of B. Jahn Production Proved Dies" highlights many die strip photos, gives graphic account of the first-rate design and production facilities.

Circle No. E2.

NEW PRESSES

New line of Bliss high speed forging presses is described in this catalog. Capacity size covered by range is from 300 to 4000 tons. Usual high standard.

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Mattison high-powered precision surface grinder has many attractive features. New catalog contains latest specifications and photos of complete range.

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This is automatic bar-stock feed device for turret lathes offering many production advantages and savings. Easy adaptation to stock equipment is big feature.

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Aid in the selection of diamond tools and indication of how to effect production economies in their use is given in this catalog.

Circle No. E11.

V-DRIVES

Maurey catalog has complete information on V-drives, parts, and accessories. Catalog has 44-pages which are well-planned so that reference is as easy as possible.

Circle No. E12.

FASTER SHEARING

Bulletin describes double angle shears for flats, bars, and angles, giving faster production on short or long runs. Precision engineered for first-rate results.

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FACING ALLOYS

Process and applications of hard facing alloys for part protection against severe conditions described in this new bulletin. This is different!

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New brochure from the F. J. Stokes Machine Company contains details of the process and applications. Economy and efficiency are the highlights.

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AIRFOIL GRINDER

New P & W turbine blade airfoil grinder operates from master cam on automatic cycle, permits holding of tolerances to a consistent .003".

Circle No. E18.

DIAMOND ACCESSORIES

Diamond wheel and micro-laps, charger rollers, lapping oil and atomizer applicator, are some of the products featured and priced in this catalog sheet.

Circle No. E13.

AIR GRINDERS

Rotor vertical air-powered grinders boast good power, weight ratio, extreme versatility, and excellent design and construction.

Circle No. E14.

JIG BORER

No. 1E is new small jig borer by P & W featuring electrolimit measuring system. Table settings accurate to .0002" are easily made.

Circle No. E21.

GRINDING "KNOW-HOW"

This folder from the Norton Company carries details of the many pieces of informative literature on grinding procedures now available from the company.

Circle No. E22.

LANDIS TYPE "C"

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Circle No. E15.

CENTRALIZED LUBRICATION

The Lincoln lubrication system has vast possibilities in the metal-working field. New bulletin contains much worth-while information.

Circle No. E16.

16 FIRSTS

This new brochure from the DoALL Co. features some of the most advanced equipment in modern gaging technique. Bring yourself up-to-date and write for your copy.

Circle No. E23.

ADVANCED TOOL LUBRICATION

Brochure from the Gulf Oil Corp. tells the story of the "Hi-Jet" lubrication system. Tool life radically increased.

Circle No. E24.

INDUSTRIAL HOSE

Carlyle Rubber Co. has issued this new brochure detailing the available range of hose assemblies ordering information is given.

Circle No. E19.

SHAPERS

Series 1800 Shear-Speed Radial Gear Shapers by Michigan Tool Co. have improved design for better performance than ever. New model added to the size range.

Circle No. E20.

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR KEY NUMBERS

. . . Cold Forming, from page 150

most likely to occur. The use of this material is of course used where very high production is expected.

The economical use of any type of material for dies and tools is dependent upon past performances obtained on similar jobs or by depending upon the experience of others. It is recommended that a complete history of die life be recorded for future reference with such pertinent information as the heat treatment, machinability factor, hardness, etc. It must also be remembered that the use of a high finish on a deep drawing punch is of extreme importance; the use of a hard chromium plated skin often being recognized as a factor in reducing tool wear.

The cast aluminum bronzes are becoming increasingly popular for deep drawing, however they are likely to wear rapidly in comparison to the alloy tool steels that are normally used. This type of material is favored where finish of drawn items is of importance. Ejection tools in deep drawing also favors the use of this material. On push-through dies, wear will be more uniform, resulting in an increase in diameter of the cylindrical shell. Other material such as the zinc base alloys, rubber, wood masonite, etc. are used either on experimental work in deep drawing, forming through the medium of spinning, stretch forming, hydraulic forming, bulging or rubber forming on a press.

The choice of lubricant in the working of stainless steels should have but one prerequisite, i.e., that it be easily removed, this being especially true for the austenitic stainless steels. The choice, of course, will be depended upon the severity of the deformation; the lubricant ranging from extreme pressure lubricants to both pigmented and non-pigmented types to soap solutions. The extreme pressure lubricants usually contain sulfurized or/and chlorinated fatty oils which are difficult to remove. In its stead, the author has found that an emulsifiable water soluble pigmented compound or a soap-wax film as encountered in the 'dry film' technique has proven to be of exceptional value.

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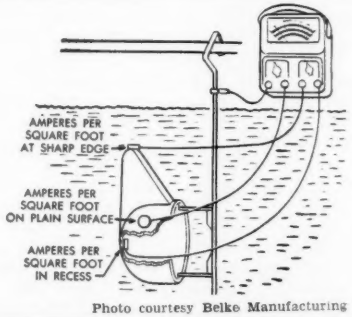
Plating Deposit Measured

Accurate determination of plating deposit at all points on any article, before plating, is made simple, quick and easy by a new type of current density meter.

This new instrument has three test leads for attaching to the surface of the article at three selected places, such as on sharp points where burning may occur, on flat surfaces and in deep recesses. By turning a dial switch on the meter, amperes per square foot can be read at each of the test points. Comparing the readings with current density chart for the solution quickly shows whether plating rate is too high or too low at any of the three selected places.



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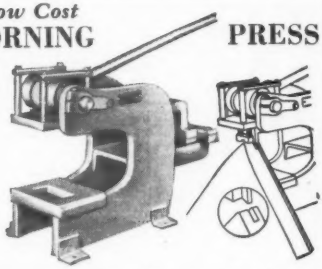

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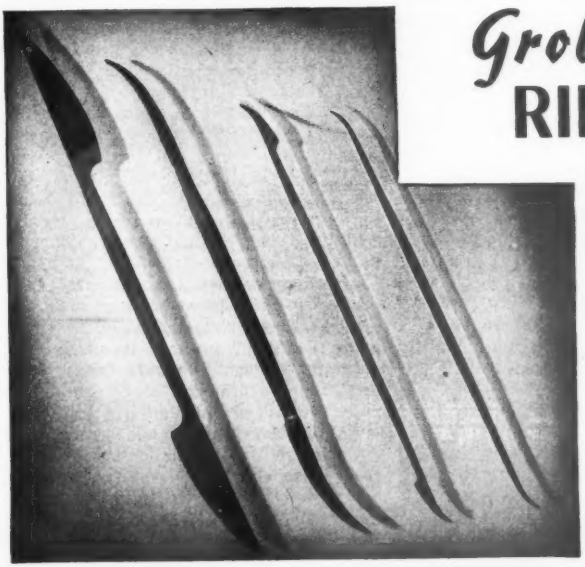

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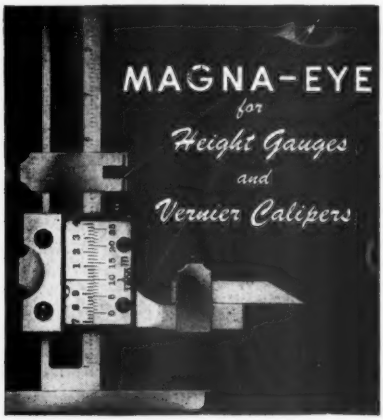

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Radioactivity Tests Tool Life

A brief abstract of a paper under the above heading was published on page 149 of the July issue of TOOLING and PRODUCTION. This paper was prepared by E. J. Krabacher research engineer; M. Eugene Merchant, assistant director of research, and Hans Ernst, director of research, all of the Cincinnati Milling Machine Company and was presented before the 1952 semi-annual meeting of the American Society of Mechanical Engineers.

The paper includes an abstract of the subject and an introduction covering the purpose of the investigation. The authors then set up under sub-heads: The Mechanics of Using Radioactive Tools and the theoretical background; Experimental Equipment and Methods; Tool Life Testing with the validity of the method; Typical Test Results; Special Studies.

Under conclusions they say, "While the 'radioactive tool wear method' of tool life testing presented in this paper is still in an exploratory stage, leaving much room for improvement in techniques and thus in results, it has been found to function very successfully and to give results which are just as reliable and more reproducible than those obtained with conventional tool life testing methods. This is achieved at a vast saving in time and work material.

"This method also opens new avenues for basic studies of the tool wear process which have been heretofore inaccessible.

"It is evident that the method is especially well suited to the rapid determination of relative values of tool wear and tool life when evaluating the effect of a series of different cutting conditions, as for instance a series of different cutting fluids or different work materials. This method thus offers considerable promise as a means of greatly speeding up the obtaining of tool life data in the laboratory, thereby allowing more complete and more rapid evaluation of advances in metal cutting science and practice."

Copies of the complete paper, which include data charts and many illustrations are now available. We have a supply of these and a copy can be obtained by writing TOOLING and PRODUCTION, 1975 Lee Rd., Cleveland 18, Ohio.

. . . Speed Control, from page 104

in contact with the driven disc and the speed of the driven disc is therefore reduced. If the ball spindle were tilted the other way, the speed of the driven disc would become the greater.

The ball spindles are slidably mounted at their ends in arcuate slots in the housing. The spindles also pass through cam slots in a disc so that when the disc is given a partial rotation by means of the control lever the ball spindles are tilted. The natural tendency is for the balls to move outwards and lose contact with the conical discs, but this is counteracted by a retaining ring that surrounds the balls.

Various numbers of balls are employed, between three and six, depending on the size and power rating of the unit. A range of units is made for horsepowers from ¼ to 6, but higher capacity gears are soon to be made. With a drive motor running at 1,500 rpm the output speed ranges between 500 and 4,500 rpm, but units for speeds up to 10,000 rpm can be supplied.

Great accuracy is needed in the manufacture of the balls so that each shall transmit its fair share of the load. To this end, the balls, conical discs and retaining rings are all hardened to Rockwell 63C, and the balls are finished to about .0001" for roundness, size and concentricity.

Power from the driven conical disc to the output shaft is transmitted through a dog clutch having shallow inclined teeth on the faces of its two engaging members. If the load increases, there is a slight relative rotation of the clutch members, causing the teeth to slide away from each other a little. This displaces the sliding clutch member axially and applies axial pressure to the driven conical disc, thus maintaining positive driving contact between disc and balls irrespective of the increased load.

The units can be adjusted manually, mechanically, or electrically, and may be adapted for remote control. They are finding uses wherever accurate stepless speed control is essential. They are, for instance, being used on lathes for maintaining continuous cutting speed when facing large workpieces.

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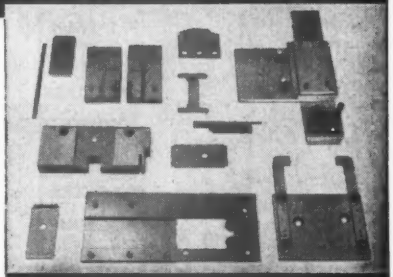

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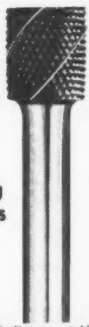

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. . . Abrasive Belt, from page 96

Precision in the manufacture of aircraft parts is a well-known headache. With the abrasive belt methods, tolerances are achieved of plus or minus .005 inches. These tolerances are easily realized and can probably be bettered. Micro finishes as low as 10 rms are achieved with the fine grit belts, whereas present methods leave a microscopic step condition which must be polished out by hand. The new abrasive belt method keeps the work temperature below 100° F., hence no metallurgical changes take place in the material. Perhaps most important of all, under actual test conditions, abrasive costs were found to be from twelve to fifteen cents per pound of aluminum removed; considerably lower than known costs for present methods. Under production conditions, there is every reason to believe that costs of the new method can be further materially reduced.

Many methods have been tried in the past in order to lick this all-important aircraft production problem. But with one exception, none have proved economically practical to date. The rolling of tapered skins, for example, is limited by width and condition of the sheet. Gang-milling of integrally stiffened sections, on the other hand, is both extremely wasteful and time-consuming. Two other methods seem to offer some hope in the future; rolling integrally-ribbed sheets and extruding and forging integrally stiffened sections. For the moment, however, skin-milling is the only practical method available to manufacturers. There are problems even here, both practical and economic. Since the skin-mill fly cutter is only twelve to fourteen inches in diameter, and since at best only two heads may be employed at the same time, the practical width of cut across the sheet is limited. The carbide-tipped cutting tools of the skin mills must be resharpened frequently, and must then be balanced in a circular head and ground to within a plus or minus five grams, otherwise excessive chatter will develop due to the high velocity of the cutter head. Such balancing and sharpening is obviously an expensive operation and requires the use of special machines, and, of course, are entirely dispensed with by the abrasive belt method.

WALLACE TENNEY MONTAGUE

The entire abrasive industry lost a great leader with the death of Wallace Tenney Montague, vice president of Norton Company, Worcester, Mass., who died suddenly on July 30.

A director of the Grinding Wheel Institute at the time of his death, and former board chairman of both the Grinding Wheel Manufacturers Association and the Abrasive Grain Association, Mr. Montague's qualities of leadership and administrative ability were effective elements in the growth and progress of his own company and that of the industry.

Relentlessly active in his own community, he served four years (1946-1950) as chairman of Worcester's Municipal Airport Commission which built and developed the city's airport. A few of his other outside affiliations included: board member, National Industrial Conference Board; Abrasive industry consultant of the National Security Resource Board of Washington; and Worcester chairman, Committee for Economic Development.

He was also a life trustee and member of the executive committee, and past president, general alumni association of Worcester Polytechnic Institute; a trustee, Worcester County Institution for Savings, and a director of the Committee on Business Information. He was a 32nd degree Mason, and a former city councilman.

Mr. Montague was born in Worcester July 2, 1889. He attended Worcester grade and high schools and graduated from Worcester Polytechnic Institute in 1912 with a BS in Mechanical Engineering—the same Institute which presented him with an honorary degree of Doctor of Engineering in 1948.

He began work for Norton Company 40 years ago in the research laboratory, entering the Sales department in 1914. Two years later he was appointed head of the Sales Engineering Department and became assistant sales manager of the Abrasive Division in 1919. In 1922 he was named assistant sales manager of the Grinding Machine Division and became its sales manager the following year.

He was appointed assistant vice president in 1939; vice president and manager Business Planning and Development in 1942—the position he held at the time of his death. Mr. Montague was elected a director in 1946, and at the same time became a member of the company's executive committee.

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. . . Magnetic Piercing, from page 114

employed. Both locating pins and stops are available as manufacturer's standards.

Although panel requirements differ, hole location tolerances are normally held as close as they can be jig-bored. Since the top and bottom templates are bored simultaneously, the concentricity between punch and bushing is well nigh perfect. This factor tends to lengthen the life of punches and bushings.

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Often the mere addition of an opening in the panel or chassis of a particular test unit keeps it up to date. In the event that a unit is obsoleted, dead storage or loss in tooling is negligible. With the magnetic piercing system, we have only to store perhaps four or five pairs of individual job templates. A permanent die would be a much more expensive storage problem, and a much greater loss if scrapped.

We are getting uniformity as well as accuracy in hole placements. The somewhat intangible savings accruing from this factor alone are often felt to justify the tooling costs. Our assembly operations proceed much more smoothly and efficiently.

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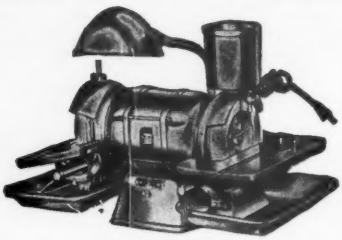

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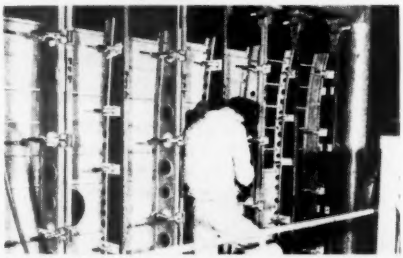
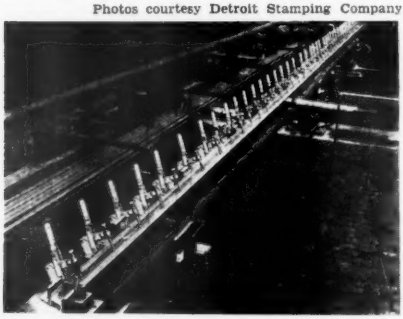


In the Kaiser-Frazier aircraft plant at Willow Run extensive use of toggle clamps is made throughout construction of the Fairchild C-119 (Flying Boxcar). The picture above shows how positive holding action is assured during drilling and riveting operations on the rear side panels which are made up of horizontal stringers, vertical frames and beams between the frames, all securely and accurately clamped in the build-up fixtures. The lower illustration shows a monorail drill jig which employs 43 toggle clamps to hold the rail during the drilling of ¼" trolley stop locating holes along the rail.

Photos courtesy Detroit Stamping Company



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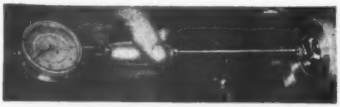

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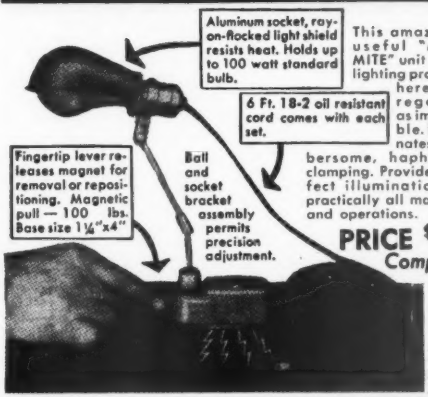
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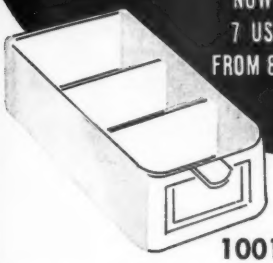
SMALL PARTS CABINETS

NOW AVAILABLE IN
7 USEFUL SIZES—
FROM 8 TO 64 DRAWERS



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Drawers are of solid aluminum, measuring 1¼" high, 2¾" wide and 5¾" deep. Individual metal drawer guides keep the drawers in a free-sliding position.

Each JIFFY Cabinet is supplied with its full requirement of removable drawer-dividers and index labels.

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☐ C.O.D.

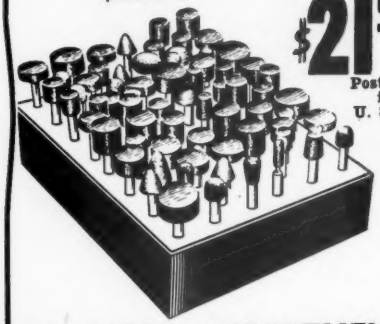
Ohio Customers Add 3% Sales Tax.

72 ABRASIVE WHEELS & POINTS

BRAND NEW PERFECT FIRST QUALITY MOUNTED ON 1/4" STEEL MANDRELS

SAVE UP TO $25.00

ONLY $21.50 Postpaid in U. S. A.



72 PIECE ASSORTMENT

ON 1/4" MANDREL

12 POPULAR SIZES & SHAPES—6 EACH On 1/4" Mandrel

1 2 3 4 5 6 7 8 9 10 11 12

	Dia.		Depth
1.	1 1/4"	x	1/4"
2.	5/8"	x	1/8"
3.	3/4"	x	1/8"
4.	5/8"	x	3/4"
5.	3/4"	x	3/4"
6.	1"	x	1/8"
7.			
8.	A-61		
9.	A-90		
10.	A-41		
11.	A-111		
12.	A-24		

	Dia.		Depth
7.	3/4"	x	1/4"
8.	3/4"	x	1/8"
9.	1/2"	x	1/2"
10.	5/8"	x	5/8"
11.	1"	x	1/8"
12.	1/4"	x	3/4"

Make no mistake. Do not let the unheard of low price mislead you. This is NOT "surplus" goods, inferior merchandise or seconds. Every one of the Wheels and Points is brand new, first quality and perfect. The type of mounting, quality of steel mandrels, grade of abrasive materials are identical to the finest on the market. Only because of our buying power, low overhead and small margin is such a sensational bargain possible.

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W-200	9 @ 55¢	4.95	B-104	9 @ 70¢	6.30
W-185	9 @ 55¢	4.95	B-61	9 @ 75¢	6.75
W-203	9 @ 60¢	5.40	B-135	9 @ 55¢	4.95
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If after 10 days you are not fully convinced that this is the greatest wheel and point value in the Industry, return the set at no cost or obligation on your part.

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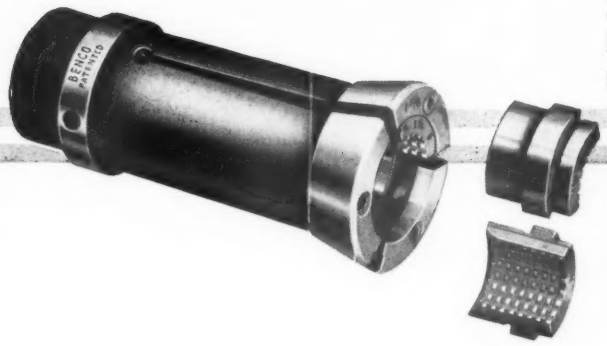
releases work quicker

BENCO COLLET



An important factor to increased production is the speed with which your collets operate. Work gripped tighter reduces "run-outs" and chatter. More production results when stock is released quicker upon the opening of the chuck head.

Benco Collets provide these advantages by being cam-ground on the taper, by the use of selected alloy steels and by proper heat treating. They are engineered to give you more production advantages, longer wearing properties and greater accuracy.

You reduce time lost changing "set-up" when you use Benco Master Collets since the pads are quickly changed without removing the collet from the spindle. "CB" Master Collets use the only pad that is interchangeable with any other pads intended for "CB" Collets of the same machine capacity, regardless of make of machine.

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Always Better Constructed
Accurate Benco Collets, Pushers and Pads

BENCO

No MYSTERY

Clearing presses are much in evidence in the Kaiser-Frazer Shadywillow plant, opened some months ago in the Wheeling area. The one in the photo is part of a line of four Clearings forming a production group in the new plant.

Kaiser-Frazer knew exactly what they were doing when they chose these Clearing presses. You see, there are Clearing presses in the parent plant at Willow Run, and they've been on the job there for quite a while.

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